



**SLOVENSKI STANDARD**  
**SIST EN 60456:1998**

**01-januar-1998**

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**Electric clothes washing machines for household use - Methods for measuring the performance (IEC 456:1994)**

Electric clothes washing machines for household use - Methods for measuring the performance (IEC 456:1994)

Elektrische Waschmaschinen für den Hausgebrauch - Prüfverfahren zur Bestimmung der Gebrauchseigenschaften

Machines électriques à laver le linge pour usage domestique - Méthodes de mesure de l'aptitude à la fonction

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**Ta slovenski standard je istoveten z: EN 60456:1994**

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**ICS:**

97.060

Aparati za nego perila

Laundry appliances

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**en**

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EUROPEAN STANDARD

REPUBLIKA SLOVENIJA  
 MINISTRSTVO ZA ZNANOST IN TEHNOLOGIJO  
 Urad RS za standardizacijo in meroslovje  
 LJUBLJANA

EN 60456

NORME EUROPEENNE

SIST. **EN 60456**

EUROPÄISCHE NORM

PREVZET PO METODI RAZGLASITVE

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Descriptors: Household electrical appliances, washing machines, spin  
 extractors, performance, test methods, comparative tests

## ENGLISH VERSION

Electric clothes washing machines for household  
 use - Methods for measuring the performance  
 (IEC 456:1994)

Machines électriques à laver le  
 linge pour usage domestique  
 Méthodes de mesure de l'aptitude  
 à la fonction  
 (CEI 456:1994)

Elektrische Waschmaschinen für  
 den Haushaltsgebrauch  
 Prüfverfahren zur Bestimmung  
 der Gebrauchseigenschaften  
 (IEC 456:1994)

## iTeh STANDARD PREVIEW

This European Standard was approved by CENELEC on 1994-03-08.  
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This European Standard exists in three official versions (English, French, German).  
 A version in any other language made by translation under the responsibility of  
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## CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Ref. No. EN 60456:1994 E

### FOREWORD

The text of document 59D(CO)37, as prepared by Sub-Committee 59D: Home laundry appliances, of IEC Technical Committee 59: Performance of household electrical appliances, was submitted to the IEC-CENELEC parallel vote in May 1992.

The reference document was approved by CENELEC as EN 60456 on 8 March 1994.

This European Standard replaces HD 584 S1:1991.

The following dates were fixed:

- latest date of publication of  
an identical national standard (dop) 1995-03-15
- latest date of withdrawal of  
conflicting national standards (dow) 1995-03-15

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annexes A, B, C and D are informative and annexes E and ZA are normative.

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### ENDORSEMENT NOTICE

The text of the International Standard IEC 456:1994 was approved by CENELEC as a European Standard without any modification.

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## ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD  
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

NOTE : When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
704-1	1982	Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances - Part 1: General requirements	HD 423.1 S1	1982
704-2-4	1989	Part 2: Particular requirements for washing machines and spin extractors	HD 423.2.4 S1	1989
704-2-6	-	Part 2: Particular requirements for tumbler dryers Project 59D(Secretariat)90, under consideration	-	-
734	1993	Hard water to be used for testing the performance of some household electrical appliances	EN 60734	1993
1121	1991	Method for measuring the performance of tumbler dryers for household use	EN 61121	1993

## Other publications:

- ISO 2267:1986 - Surface active agents - Evaluation of certain effects of laundering Methods of preparation and use of unsoiled cotton control cloth
- ISO 3758:1991 - Textiles - Care labelling code using symbols
- ISO 3801:1977 - Textiles - Woven fabrics - Determination of mass per unit length and mass per unit area
- ISO 4319:1977 - Surface active agents - Detergents for washing fabrics Guide for comparative testing of performance
- ISO 6330:1984 - Textiles - Domestic washing and drying procedures for textile testing
- ISO 7211-2:1984 - Textiles - Woven fabrics - Construction - Methods of analysis Part 2: Determination of number of threads per unit length
- ISO 7768:1985 - Textiles - Methods for assessing the appearance of durable press fabrics after domestic washing and drying

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Machines électriques à laver le linge  
pour usage domestique –  
Méthodes de mesure de l'aptitude  
à la fonction

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(Electric clothes washing machines  
for household use –  
Methods for measuring the performance

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International Electrotechnical Commission  
Международная Электротехническая Комиссия

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC CLOTHES WASHING MACHINES  
FOR HOUSEHOLD USE –  
METHODS FOR MEASURING THE PERFORMANCE**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
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International Standard IEC 456 has been prepared by sub-committee 59D: Home laundry appliances, of IEC technical committee 59: Performance of household electrical appliances.

It forms the second edition of IEC 456 and replaces the first edition and its amendments Nos. 1 and 2. It also replaces IEC 985 which has been included.

The text of this standard is based on the following documents:

DIS	Report on voting
59D(CO)37	59D(CO)38

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

## INTRODUCTION

IEC 456 (1974) and its amendments 1 (1980) and 2 (1987) concern exclusively the performance of the cotton programme of electric clothes machines.

Ulteriorly, IEC 985 (1989) described a method of measurement of the felting severity of the wool wash programme of these machines.

At the time of issue of these publications, one important point of controversy concerned the nature of the soiled clothing to be used during the measurements and in particular whether the textile material should be artificially or naturally soiled.

Since then, a great lot of work and many ring tests have been done within sub-committee 59D and its working groups in order to:

- compare the results obtained with the different soiling techniques;
- improve the reproducibility of the prescribed methods of measurement;
- evaluate the performance of other cycles than the cycles for white cotton;
- introduce a method for measuring the cleaning performance of easy care textiles;
- take into account the technical evolution of detergents.

This second edition of IEC 456 gives the present result of this work.

It replaces not only IEC 456 and its amendments 1 and 2, but also IEC 985, which has been included within it.

Concerning the choice of soilings for the determination of washing performance, both methods have been kept:

- the use of artificially soiled textile material, which was selected for the method given in 5.1.1, reduces the problems of reproducibility; to some extent such a technique ensures correlation with practical use;
- the method given in annex C describes how the washing performance can be determined by judging the soil and stain removal of naturally soiled articles. This method has a high correlation with practice but its execution is rather complicated.

Concerning the detergent to be used for the tests, a new formula has been prepared by IEC/SC 59D/WG 4. So, it has been introduced as an alternative to the formula in IEC 456 - Amendment 1(1980).

The other differences with IEC 456 (1974) and its amendments 1 (1980) and 2 (1987) are:

- Possibility of using other cycles than the cycle for white cotton.
- Inclusion of a method for measuring the cleaning performance of easy care textiles;

- Modifications of the method of determination of the washing performance (5.1.1), aiming to provide better reproducibility: precisions for the way of loading of the machine, more accurate control of the tolerances of the reference machine or use of the microprocessor Wascator FOM 71.

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## ELECTRIC CLOTHES WASHING MACHINES FOR HOUSEHOLD USE – METHODS FOR MEASURING THE PERFORMANCE

### 1 Scope

This International Standard deals with the methods for measuring the performance of electric clothes washing machines, of water-extracting machines and of washing and water-extracting machines, either with or without heating devices, for household use.

This standard is concerned neither with safety nor with performance requirements.

It also applies to combinations of these machines with heated dryers; for the drying performance of these combined machines (called washer-dryers), the application of IEC 1121 is under consideration.

NOTE - Washing machines for communal use in blocks of flats or in laundrettes are within the scope of this recommendation, but machines for commercial laundries are not included.

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### 2 Normative references (standards.iteh.ai)

The following normative documents contain provisions which through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 704-1: 1982, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances - Part 1: General requirements*

IEC 704-2-4: 1989, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances - Part 2: Particular requirements for washing machines and spin extractors*

IEC 704-2-6: *Test code for the determination of airborne acoustical noise emitted by household and similar appliances. - Part 2: Particular requirements for tumbler dryers. Project 59D(Secretariat)90, under consideration*

IEC 734: 1993, *Hard water to be used for testing the performance of some household electrical appliances*

IEC 1121: 1991, *Method for measuring the performance of tumbler dryers for household use*

ISO 2267: 1986, *Surface active agents - Evaluation of certain effects of laundering - Methods of preparation and use of unsoiled cotton control cloth*

ISO 3758: 1991, *Textiles - Care labelling code using symbols*

ISO 3801: 1977, *Textiles - Woven fabrics - Determination of mass per unit length and mass per unit area*

ISO 4319: 1977, *Surface active agents - Detergents for washing fabrics - Guide for comparative testing of performance*

ISO 6330: 1984, *Textiles - Domestic washing and drying procedures for textile testing*

ISO 7211-2: 1984, *Textiles - Woven fabrics - Construction - Methods of analysis - Part 2: Determination of number of threads per unit length*

ISO 7768: 1985, *Textiles - Methods for assessing the appearance of durable press fabrics after domestic washing and drying*

### 3 Definitions

For the purpose of this International Standard, the following definitions apply:

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#### 3.1 Terms used to designate the appliances

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**agitator-type washing machine:** A machine in which the textile material is substantially immersed in the washing water; in which the mechanical action is produced by a device moving about or along its vertical axis with a reciprocating motion.

**horizontal drum type electric washing machine:** An electric washing machine in which the textile material is placed in a horizontal drum and partially immersed in the washing water, the mechanical action being produced by rotation of the drum about its axis, the movement being either continuous or periodically reversed.

**impeller-type washing machine:** A machine in which the textile material is substantially immersed in the washing water; in which the mechanical action is produced by a device rotating about its axis with a motion which may be continuous or may reverse after a number of revolutions.

**spin extractor:** A water-extracting machine in which water is removed from textile material by centrifugal force.

**washing and spinning machine:** A horizontal drum-type electric washing machine in which, at the end of the wash cycle the water is removed from the textile material, by centrifugal force, with or without heating device.

**washer-dryer:** A washing and spinning machine which also incorporates a means of tumble drying the wash load.

### 3.2 Terms used for textiles

**easy care textiles:** Textiles which are specified or labelled by the manufacturer as being in conformity with ISO 3758 and carry the relevant symbol.

**ballast:** Machine load without strips of standardized soiling.

**wash load:** Machine load consisting of ballast, soiled standard strips and any added test specimens.

### 3.3 Terms used to designate the characteristics of appliances

**rated capacity:** The maximum mass of dry textile material, in kilogrammes, which the manufacturer declares can be treated for washing in a single operation or cycle of operations.

#### NOTES

1 If the rated capacity is not specified by the manufacturer it can be deduced from the volume according to the following ratios:

- drum type machine: 13 l of volume per kg of dry material;
- spin extractor: 4,6 l of volume per kg of dry material.

2 If the rated capacity for easy care textiles and woollens is not specified by the manufacturer, the load should be respectively 40 % and 20 % of that for cotton.

3 In case the manufacturer gives two limits for the rated capacity, e.g. 4,5 kg-5 kg, the greater will be chosen for the measurements.

**volume of an agitator or impeller-type washing machine:** The inside volume, in litres, of the tub available for the movement of the textile material up to the nominal water level as determined by the machine controls or the manufacturer's instructions.

**volume of a drum type washing machine or spin extractor:** The inside volume, in litres, of the drum in which the textile material is placed, after subtraction of ribs or other inward forms, etc.

## 4 General notes on measurements

### 4.1 List of measurements

Performance is determined by carrying out the measurements indicated in table 1.

Table 1 – Measurements to determine performance

Measurements	Subclause	Washing machines	Spin extractors	Washing and spinning machines
Washing performance	5.1	X		X
Rinsing efficiency	5.2	X		X
Water extracting efficiency	5.3		X	X
Water and energy consumption	5.4	X	X <sup>1)</sup>	X
Mechanical detergent loss	5.5	X		X
Felting severity of the wool wash programme	5.6	X		X
Wrinkling	5.7	X	X	X
Wear suffered by textile	5.8	X	X	X
Airborne acoustical noise	5.9	X	X	X

<sup>1)</sup> For spin extractors only the measurement of energy consumption is performed.

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#### 4.2 General conditions for measurements

All tests shall be in line with the manufacturer's instructions.

Unless otherwise specified measurements are conducted under the following conditions:

##### 4.2.1 State of machine

Measurements shall be carried out on a new machine installed for use in accordance with the manufacturer's instructions. Before commencing measurements the machine shall be run for two complete cycles, at maximum temperature; the first without load and with 50 g of the reference detergent, the second without load or detergent.

##### 4.2.2 Supply voltage and frequency

The supply voltage shall be maintained at the rated voltage of the machine  $\pm 2$  %. When the appliance is specified by a rated voltage range, the measurements are to be carried out at a voltage equal to the mean value of the range  $\pm 2$  %.

The supply frequency shall not differ by more than 1 % from the rated frequency of the machine.

NOTE - If the rated voltage of the machine differs from the system voltage of the country of sale, measurements shall be carried out at the voltage of the country of sale  $\pm 2$  %.