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Tumble dryers for household use – Methods for measuring the performance

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TUMBLE DRYERS FOR HOUSEHOLD USE – METHODS FOR MEASURING THE PERFORMANCE

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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International Standard IEC 61121 has been prepared by subcommittee 59D: Home laundry appliances, of IEC technical committee 59: Performance of household electrical appliances.

This consolidated version of IEC 61121 consists of the third edition (2002) [documents 59D/219/FDIS and 59D/222/RVD], its amendment 1 (2005) [documents 59D/286/FDIS and 59D/296/RVD] and its corrigenda of April 2003 and September 2003.

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

It bears the edition number 3.1.

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

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

Annexes A, B, C and D form an integral part of this standard.

In this standard, the following print types are used:

– *test specifications: in italic type;*
– notes: in small roman type;
– other text: in roman type.

Words in **bold** in the text are defined in clause 3.

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.

INTRODUCTION

This third edition has been developed in light of experience with use of the second edition of IEC 61121. Other changes include some minor revisions to the test conditions and alterations to the test load to ensure that this remains harmonised with the IEC 60456 load for clothes washers.

In summary, the main changes are as follows.

1) General:
   - more terms have been defined and some previous definitions have been streamlined, in addition to the correction of some symbols and equations;
   - where possible, definitions and terms have been used in common with IEC 60456;
   - the content has been organised into a more logical and simple structure, and repetitive sections have been removed.
2) The conditions of measurement:
   - the wording of various sections has been revised to reduce ambiguity;
   - limits have been defined for water conductivity for auto-sensing dryers that are sensitive to conductivity, as well as methods to adjust conductivity where necessary;
   - specifications of a nominal exhaust duct were included.
3) Reproducibility and repeatability of test results:
   - revision of the specification for the cotton test load to include suitable test materials which are currently available on the market;
   - more careful definition of the process and conditions for **pre-treatment, conditioning** and **normalisation.**
4) Test methods:
   - accuracy of measurement has been defined for all instruments;
   - limits and interpretations of the allowable final moisture content for each type of dryer are now defined;
   - practical advice regarding the test procedure has been given with the aim of reducing ambiguity.

TUMBLE DRYERS FOR HOUSEHOLD USE – METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This International Standard is applicable to household electric **tumble dryers** of the **automatic** and **non-automatic** type, with or without a cold water supply and incorporating a heating device.

The object is to state and define the principal performance characteristics of household electric **tumble dryer**s of interest to users and to describe standard methods for measuring these characteristics.

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

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60456, *Clothes washing machines for household use – Methods for measuring the performance*

IEC 60734, *Hard water to be used for testing the performance of some household electrical appliance*

IEC 61036, *Alternating current static watt-hour meters for active energy (Classes 1 and 2)*

IEC 61591:1997, *Household range hoods – Methods for measuring performance*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices – Part 1: Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full*

3 Definitions and symbols

For the purposes of this standard, the following definitions apply.

3.1
tumble dryer
appliance in which textile material is dried by tumbling in a rotating drum, through which heated air is passed

3.2
air vented tumble dryer
tumble dryer with a fresh-air intake which is heated and passed over the textile material and where the resulting moist air is exhausted into the room or vented outside

3.3
condenser tumble dryer
tumble dryer in which the air used for the drying process is dehumidified by cooling

NOTE Combinations of the above-mentioned types are possible.

3.4
automatic tumble dryer
tumble dryer which switches off the drying process when a certain moisture content of the load is reached

NOTE This may include conductivity or temperature sensing

3.5
non-automatic tumble dryer
tumble dryer which does not switch off the drying process when a certain moisture content of the load is reached, usually controlled by a timer, but may also be manually controlled

3.6
pre-treatment
successive washing, rinsing, spinning and drying of a new test load prior to its first use to avoid rapid changes of characteristics during the tests

3.7
normalisation
successive washing, rinsing, spinning and drying of a test load after a pre-determined number of cycles to bring the test load to a normal state

3.8
conditioning
treatment of test load to assure homogenous condition

3.9
programme
series of operations which are pre-defined and which are declared as suitable for drying certain types of textiles

3.10
cycle
complete drying process, as defined by the **programme** selected, consisting of a series of different operations (heat, cool down etc.)

3.11
rated capacity
mass in kg of dry textiles of a particular defined type, which the manufacturer declares can be treated in a specific **programme**

3.12 List of symbols

μ_f	actual final moisture content of the test load (%)
μ_{f0}	nominal final moisture content (%) given in table 3, without tolerances
μ_{fi}	actual final moisture content of the test load after the i:th **cycle** (%)
μ_{fj}	actual final moisture content of the j:th individual piece of textile in a **cycle** (%)
μ_i	actual initial moisture content (%)
μ_j	arithmetic average of $\mu_{(f, j)}$ for all individual load items
μ_{i0}	nominal initial moisture content (%) given in table 2, without tolerances
μ	arithmetical average of μ_f for all i **cycles**
C	condensation efficiency (%)
E_m	measured energy consumption kWh
E	corrected energy consumption kWh
L_m	measured water consumption (l)
L	corrected water consumption (l)
n	number of **cycles**
s_b	standard deviation as a measure of the variability between **cycles** in one test series
S_w	average drying evenness
s_{wr}	standard deviation for the evenness of drying within a load
W	**rated capacity** for the **programme** (g)
W_0	conditioned mass of the test load (g)
W_f	mass of the test load after drying, "the final mass"
W_i	mass of the test load after wetting (but before drying), "the initial mass"
W_w	mass of the condensed water
t_m	measured **programme** time
t	corrected **programme** time

4 Dimensions

Height a_1 = vertical dimension measured from the lower edge (on the floor) to the upper edge of the top, with the door closed. If adjustable levelling feet are provided, they shall be moved up and down to determine minimum and maximum possible heights.

Height a_2 = maximum vertical dimension measured from the lower edge (on the floor) to a horizontal plane at the maximum height of the tumble dryer with the door open. If adjustable levelling feet are provided, they shall be moved up and down to determine minimum and maximum possible heights.

Width b = horizontal dimension, between the sides, as measured between two parallel vertical planes against the sides of the tumble dryer, including all projections.

Depth c_1 = horizontal dimension as measured from a vertical rear plane against the **tumble dryer** and the most prominent part of the front, knobs and handles not being taken into account, with the door closed.

Depth c_2 = horizontal **dimension** as measured from a vertical rear plane against the **tumble dryer** and the most prominent part of the front knobs and handles not being taken into account, with the door open.

Drum volume = the volume of the drum in which textiles are placed, determined as the inside volume of the drum, in litres, after subtraction of ribs or other inward protrusions, etc.