

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



Tumble dryers for commercial use – Methods for measuring the performance

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 97.060

ISBN 978-2-8322-4519-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and symbols.....	8
3.1 Terms and definitions.....	8
3.2 List of symbols.....	11
4 Requirements	12
4.1 General.....	12
4.2 Rated capacity	13
4.3 Dimensions	13
5 Test conditions, materials, equipment and instrumentation	13
5.1 General.....	13
5.2 Ambient conditions.....	14
5.2.1 Electricity supply	14
5.2.2 Water supply	14
5.2.3 Ambient temperature and humidity.....	15
5.3 Test materials	15
5.3.1 General	15
5.3.2 Test load	15
5.3.3 Detergent	16
5.4 Equipment	16
5.4.1 Equipment for normalization	16
5.4.2 Equipment for conditioning the test load	16
5.4.3 Equipment for wetting the test load prior to a test	16
5.4.4 Equipment for measurement.....	16
5.5 Instrumentation and accuracy	17
6 Preparation for testing.....	17
6.1 General.....	17
6.2 Test specifications from manufacturers	18
6.3 Installation of the tumble dryer.....	18
6.4 Preparation of the tumble dryer for a test series.....	18
6.5 Preparation of the tumble dryer for a test run	18
6.6 Preparation of test loads	19
6.6.1 General	19
6.6.2 Pre-treatment of new test load items prior to use	19
6.6.3 Requirements regarding the age of test load items	19
6.6.4 Normalization of test load items.....	19
6.6.5 Conditioning of test load items.....	20
6.6.6 Test load composition.....	20
6.6.7 Wetting.....	22
7 Performance measurements – General requirements.....	23
8 Tests for performance.....	24
8.1 General.....	24
8.2 Test procedure for performance tests.....	24
8.2.1 Test conditions, materials and preparation for testing	24
8.2.2 Programme.....	24

8.2.3	Test load	25
8.2.4	Test procedure	25
8.2.5	Validity of a test run.....	25
8.2.6	Validity of a test series	25
8.3	Measurements to determine water and energy consumption and programme time	26
8.3.1	General	26
8.3.2	Procedure.....	26
8.4	Measurements to determine condensation efficiency	26
8.4.1	General	26
8.4.2	Procedure.....	27
8.5	Measurements to determine exhaust air volume.....	27
8.6	Performance measurement at maximum exhaust duct pressure	27
8.7	Measurement of the textile drying temperature.....	27
9	Assessment of performance	27
9.1	General.....	27
9.2	Final moisture content of the load	28
9.3	Total energy.....	28
9.4	Corrected energy	28
9.5	Corrected water consumption.....	29
9.6	Corrected programme time.....	29
9.7	Condensation efficiency	30
9.8	Evaporation capacity.....	31
9.9	Exhaust air volume	31
10	Data to be reported.....	31
Annex A (normative)	Reference list.....	32
A.1	Reference detergent	32
A.2	Specification of test load	32
A.3	The bone dry method of conditioning	32
A.4	Uncertainty of measurement	32
A.5	Environmental aspects of tumble dryer use	32
A.6	Source of materials and supplies	32
A.7	Washing machine for normalization.....	32
Annex B (normative)	Exhaust ducts for tumble dryer testing	33
B.1	General.....	33
B.2	Specification of the exhaust duct type 1	33
B.2.1	Duct material	33
B.2.2	The form of the duct	33
B.2.3	Instrumentation.....	34
B.3	Exhaust duct type 2	34
B.3.1	General	34
B.3.2	Specification of exhaust duct Type 2.....	34
B.3.3	Setting the correct exhaust duct pressure	34
Annex C (informative)	Flow diagrams.....	38
Annex D (normative)	Test report – Data to be reported	41
Annex E (normative)	Procedure to determine test load size where rated capacity is not declared.....	45
E.1	General.....	45

E.2	Determination of the volume of the clothes container	45
E.3	Determination of the test load	45
Annex F (normative)	Flexible initial moisture content method	46
F.1	General.....	46
F.2	Procedure	46
F.3	Evaluation.....	46
Annex G (normative)	Performance testing of steam heated tumble dryers.....	48
G.1	General.....	48
G.2	Types of steam heating – Steam heated tumble dryers	48
G.3	Specification of steam properties	48
G.3.1	Type of steam.....	48
G.3.2	Steam generator.....	48
G.4	Equipment and instrumentation.....	48
G.4.1	Test equipment for measuring the characteristics of steam	48
G.4.2	Instruments	49
G.5	Installation	49
G.5.1	General	49
G.5.2	Installation of the measurement equipment for indirect steam heated tumbler dryers.(Alternative 1)	49
G.5.3	Installation of the measurement equipment for indirect steam heated tumble dryers. (Alternative 2).....	51
G.6	Preparation for testing	52
G.6.1	General	52
G.6.2	Indirect heated tumble dryer installed according to Alternative 1	52
G.6.3	Indirect heated tumble dryer installed according to alternative 2	53
G.7	Tests for performance	53
G.7.1	General	53
G.7.2	Performance testing of indirect steam heated tumble dryer installed according to alternative 1	53
G.7.3	Performance testing of indirect heated tumble dryers installed according to Alternative 2	53
G.8	Assessment of performance	54
G.8.1	General	54
G.8.2	Evaluation of performance of indirect heated tumble dryer installed according to alternative 1	54
G.8.3	Evaluation of performance of indirect heated tumbler dryers installed according to alternative 2	55
G.8.4	Evaluation of total energy supplied to the tumbler dryer by steam.....	55
G.9	Data to be reported.....	56
Annex H (informative)	Performance testing of gas heated tumble dryers.....	57
H.1	General.....	57
H.2	Installation, testing procedure and calculation of supplied gas energy.....	57
Annex I (informative)	Measurement of exhaust air volume	58
I.1	Procedure	58
I.2	Exhaust air volume	58
Annex J (normative)	Measurement of the textile drying temperature	59
J.1	General.....	59
J.2	Specification of the loggers.....	59
J.3	Preparation of the loggers before measurement.....	59
J.4	Number of loggers	59

J.5	Measuring the temperature	60
J.6	Presenting the result.....	60
	Bibliography.....	61
Figure B.1	– Exhaust duct bend	33
Figure B.2	– Exhaust duct Type 2	35
Figure C.1	39
Figure C.2	40
Figure G.1	– Schematic installation of the measurement equipment for steam heated tumble dryers (Alternative 1).....	50
Figure G.2	– Schematic installation of the measurement equipment for steam heated tumble dryers (Alternative 2).....	52
Table 1	– List of symbols	11
Table 2	– Specification of instruments.....	17
Table 3	– Number of items in the test load for various test load masses	21
Table 4	– Specifications for initial moisture content in the test load.....	23
Table 5	– Specification for final moisture content of the test load after drying in a cotton dry programme	24
Table B.1	– Equivalent tube length of a 90° bend.....	33
Table B.2	– Pressure drop values for different diameters and flows for a 15 m long duct	36
Table D.1	– Identification data	41
Table D.2	– Test measurements	42
Table D.3	– Test conditions and materials	44
Table J.1	– Specification of temperature logger suitable for temperature measurement for both washing and drying	59
Table J.2	– Number of temperature loggers to be used during a textile drying temperature measurement	60

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TUMBLE DRYERS FOR COMMERCIAL 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 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.

A PAS is an intermediate specification not fulfilling the requirements for a standard, but made available to the public.

IEC PAS 63124 has been processed by subcommittee 59D: Performance of household and similar electrical laundry appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
59D/447/DPAS	59D/451/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This document is based on CLC/TS 50594:2015.

This PAS shall remain valid for an initial maximum period of 2 years starting from the publication date. The validity may be extended for a single period up to a maximum of 2 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

TUMBLE DRYERS FOR COMMERCIAL USE – METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This PAS is applicable to **tumble dryers** for commercial use of the **automatic** and **non-automatic** type, incorporating an electric or steam heating device. It also includes **tumble dryers** which use gas as a heating source with a reference to appropriate EN gas standards.

The object is to state and define the principal performance characteristics of **tumble dryers** for commercial use of interest to users and to describe standard methods for measuring these characteristics.

NOTE It does not apply to **transfer tumble dryers** or dryers with automatic loading and unloading.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 12953-10, *Shell boilers – Part 10: Requirements for feedwater and boiler water quality*

EN 50570:2013, *Household and similar electrical appliances – Safety – Particular requirements for commercial electric tumble dryers*

CLC/TS 50640:2015, *Clothes washing machines for commercial use – Methods for measuring the performance*

EN 60456:2011, *Clothes washing machines for household use – Methods for measuring the performance* (IEC 60456:2010, modified)

EN 60734, *Household electrical appliances – Performance – Water for testing* (IEC 60734)

EN 62053-21, *Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)* (IEC 62053-21)

ISO 80000-1:2009, *Quantities and units – Part 1: General*