

PUBLICLY
AVAILABLE
SPECIFICATION

IEC
PAS 62473

Pre-Standard

First edition
2007-04

**Clothes washing machines
for household use –
Methods for measuring the mechanical
action in household washing machines**

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC PAS 62473:2007](https://standards.iteh.ai/standards/iec/a22b434b-aa5c-4f03-b94d-46242bf47c55/iec-pas-62473-2007)

<https://standards.iteh.ai/standards/iec/a22b434b-aa5c-4f03-b94d-46242bf47c55/iec-pas-62473-2007>



Reference number
IEC/PAS 62473:2007(E)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

▪ Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

▪ IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

▪ Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

IEC PAS 62473:2007

<https://www.internationalstandards.org/a22b734b-aa5c-4f03-b94d-46242bf47c55/iec-pas-62473-2007>

PUBLICLY
AVAILABLE
SPECIFICATION

IEC
PAS 62473

Pre-Standard

First edition
2007-04

**Clothes washing machines
for household use –
Methods for measuring the mechanical
action in household washing machines**

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC PAS 62473:2007](https://standards.itih.ai/standards/iec/pas/62473:2007)

<https://standards.itih.ai/standards/iec/pas/62473:2007>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

V

For price, see current catalogue

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and symbols	6
4 General conditions for measurements	6
4.1 General.....	6
4.2 Resources and ambient conditions.....	7
5 Materials	7
5.1 Base load.....	7
5.2 Test materials.....	7
5.2.1 Thread removal material	7
5.2.2 Dot removal material	8
5.2.3 Fraying specimens.....	8
5.3 Preparation	8
5.4 Amount of test specimens used.....	8
5.5 Detergent.....	9
6 Instrumentation and accuracy	9
7 Test procedure	9
7.1 Loading	9
7.2 Unloading and drying of test specimens	9
7.3 Repeating of test procedure.....	9
8 Evaluation	10
8.1 Thread removal method.....	10
8.2 Dot removal method	10
8.3 Fraying method.....	10
9 Data to be reported.....	10
10 Sources of test materials	10
10.1 Thread removal method (5.2.1)	10
10.2 Dot removal method (5.2.2).....	10
10.3 Fraying method (5.2.3)	11
Annex A (normative) Thread removal material – Preparation of test specimen.....	12
Annex B (normative) Loads and loading	13
B.1 General	13
B.2 Test load mass	13
B.3 Loading	15
Annex C (normative) Thread removal material – Evaluation	27
C.1 General	27
C.2 Evaluation	28
Annex D (normative) Dot removal material – Evaluation.....	31
D.1 Evaluation	31

Annex E (normative) Fraying material – Evaluation.....	33
E.1 General.....	33
E.2 Evaluation.....	33
Figure 1 – Thread removal specimen.....	7
Figure 2 – Dot removal specimen.....	8
Figure 3 – Fraying specimen.....	8
Figure B.1 – General loading direction for horizontal axis machines.....	17
Figure B.2 – How to load towel/pillowcase with strip.....	17
Figure B.3 – How to load towel without strip.....	18
Figure B.4 – How to load pillowcases without strip.....	18
Figure B.5 – How to load bed sheets.....	19
Figure B.6 – General loading directions for vertical axis machines.....	21
Figure B.7 – How to load towels/pillowcases with strip.....	22
Figure B.8 – How to load towels without strips.....	22
Figure B.9 – How to load pillowcases without strip.....	23
Figure B.10 – How to load bed sheets.....	23
Figure C.1 – Thread removal specimen after test run.....	27
Figure C.2 – “Not remaining” and “remaining” threads.....	28
Figure C.3 – Thread counting after test run.....	28
Figure C.4 – Square counting after test run: left and right side examples.....	29
Figure D.1 – Measuring spots on dot removal specimen.....	31
Figure E.1 – Part of fraying specimen after test run.....	33
Figure E.2 – Evaluation for test specimen 1.....	34
Table B.1 – Cotton test load mass.....	13
Table B.2 – Synthetics/blends test load mass.....	14
Table B.3 – Polyester test load mass.....	15
Table B.4 – Loading sequence step by step for horizontal axis machine.....	20
Table B.5 – Small loads without sheet (1,0 to 2,5 kg).....	24
Table B.6 – Average loads with two sheets (3,0 to 7,0 kg).....	25
Table B.7 – Large loads with three sheets (7,5 to 8,5 kg).....	25
Table B.8 – Extra large loads with four sheets (9,0 to 10,0 kg).....	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CLOTHES WASHING MACHINES FOR HOUSEHOLD USE –
METHODS FOR MEASURING THE MECHANICAL ACTION
IN HOUSEHOLD WASHING MACHINES**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 a technical specification not fulfilling the requirements for a standard but made available to the public.

IEC-PAS 62473 has been processed by IEC subcommittee 59D: Home 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/305/NP	59D/308/RVN

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

This PAS shall remain valid for an initial maximum period of three years starting from 2007-04. The validity may be extended for a single three-year period, following which it shall be revised to become another type of normative document or shall be withdrawn.

INTRODUCTION

Mechanical action is a main parameter in a washing process. On the positive side, this parameter improves washing performance but can cause damage to textile goods. In today's IEC standards, mechanical action has not been determined as a single parameter in washing processes.

Mechanical action has a high relevance for consumers as well as for manufacturers of washing machines, and therefore a comparison of this parameter (especially in relation or comparison to the achieved washing performance as measured in IEC 60456) in different washing machines is very important.

The object is finally to state and define a method for the determination of mechanical action. Due to the fact that washing programmes cover a wide range of mechanical action (gentle cycles to heavy-duty cotton programmes, single cycles to multiple cycles), three systems

- the thread removal method;
- the dot removal method;
- the fraying method

can cover this area and are at the same time sensitive enough to show smaller differences.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC PAS 62473:2007](https://standards.iteh.ai/standards/iec/62473/2007)

<https://standards.iteh.ai/standards/iec/62473/2007>

CLOTHES WASHING MACHINES FOR HOUSEHOLD USE – METHODS FOR MEASURING THE MECHANICAL ACTION IN HOUSEHOLD WASHING MACHINES

1 Scope

This PAS deals with methods for measuring the “gentleness of action” (GoA) of clothes washing machines for household use, with or without heating devices and for cold and/or hot water supply. It is also applicable to appliances for both washing and drying textiles (called washer-dryers) with respect to the washing phase.

“Gentleness of action” defines the influence of washing machine parameters to irreversible changes of the textile properties. These changes can be visible or not visible.

Examples of these irreversible changes are:

- loss of tensile tear strengths;
- surface friction (abrasion, pilling);
- dimensional changes (shrinkage or elongation);
- creasing;
- “structural disorientation”.

Three methods for different ranges of mechanical action are described to measure and quantify the influences of the machine parameters by measuring one or several of these irreversible changes:

- thread removal method (TRM – preferable for low to medium mechanical action);
- dot removal method (DRM – preferable for high mechanical action);
- fraying method (FM – preferable for medium to high mechanical action).

2 Normative references

The following referenced document including all reference documents cited there 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*

3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols of IEC 60456 apply.

4 General conditions for measurements

4.1 General

The measurements shall generally be carried out on a machine installed and used in accordance with the manufacturer’s instructions, except as required by this document. If there is more than one option for installation, the one chosen for testing shall be reported. If the

machine is new, the machine shall be run for two complete test **cycles** according to IEC 60456.

4.2 Resources and ambient conditions

Electricity and water supply as well as the ambient temperature shall be maintained at specified values stated in IEC 60456.

5 Materials

5.1 Base load

The base loads used shall consist of the items described for cotton, easy-care (synthetics/blends) or polyester base loads according to IEC 60456.

The base loads are adjusted and treated according to IEC 60456.

The number of items is specified in Annex B.

5.2 Test materials

5.2.1 Thread removal material

5.2.1.1 Characteristics

The thread removal material is a woven fabric having an open structure to all sides allowing loosening of threads by mechanical impact (see Figure 1).

5.2.1.2 Specification

Size: about 29,5 × 29,5 cm
 Weave: plain woven
 Yarn: DTEX 228 F34 PA 66
 Yarn count per cm: Warp/Filling 17/17
 Weight: about 85 g/m²

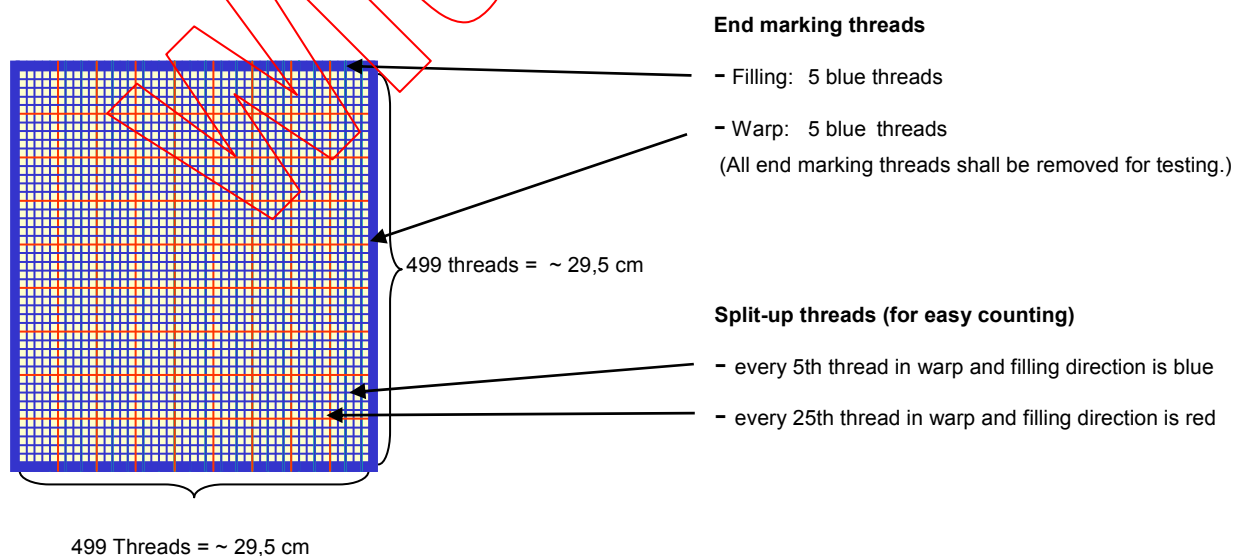


Figure 1 – Thread removal specimen

5.2.2 Dot removal material

5.2.2.1 Characteristics

The dot removal material is a stiff fabric with bonded coloured dots which are removed by mechanical impact (see Figure 2).

5.2.2.2 Specification



Size:	34 × 34 cm
Basic fabric:	00 % Cotton, plain woven, white, 125 g/m ²
Yarn:	Nm 34/34
Yarn count per cm:	Warp/Filling 19,5/19,5
Dots:	100 % PA, coloured
Density of dots:	45,5/cm ²
Density of dots:	about 45,5/ cm ²
Weight	about 140 g/m ²

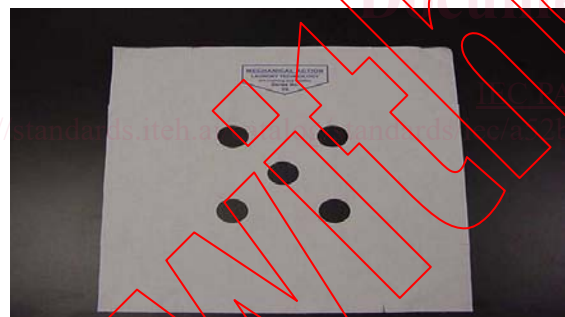
Figure 2 – Dot removal specimen

5.2.3 Fraying specimens

5.2.3.1 Characteristics

The fraying specimen is a cotton fabric with five punched holes having an open structure allowing loosening of threads by mechanical impact.

5.2.3.2 Specification



Size:	40 × 40 cm
Circular holes diameter:	35 mm
Fibre content:	100 % pure natural cotton of 27 mm minimum length
Yarn size - linear density:	single yarn 30 + 2 tex
Yarn twist:	Z 700 + 25
Warp strength:	at least 500 N
Warp yarn count:	25 + 2 threads per cm
Filling yarn count:	25 + 2 threads per cm

Figure 3 – Fraying specimen

5.3 Preparation

All test specimens shall be marked with a unique identifying reference, using an indelible marking system.

The thread removal material shall be prepared before use as described in Annex A.

The dot removal specimens have to be measured before use as described in Annex D.

5.4 Amount of test specimens used

For each wash cycle, four test specimens of only one type regardless of test load size and type shall always be used.

5.5 Detergent

The detergent used for this test shall be reference detergent A* described in IEC 60456

6 Instrumentation and accuracy

Instrumentation and accuracy of IEC 60456 apply.

For the fraying method the following tools are needed:

- magnifying glass;
- black background for assistance in counting threads;
- needle or similar instrument;
- rule calibrated in millimetres.

7 Test procedure

The test is basically run in accordance to the test of washing performance described in IEC 60456 except that, additionally, the test specimens according to this document are added to the load in the drum according to the following description.

7.1 Loading

The way of loading the machine influences the results. To get reproducible results it is necessary to define the way of loading the machine and to follow the instructions accurately.

The loading scheme of IEC 60456 is only applicable for one type of washing machine (horizontal axis). The loading procedure as described in Annex B applies to all types of washing machines and will probably be included in a future edition of IEC 60456.

The test specimens for measuring the gentleness of action according to this procedure are added as described in Annex B.

The test specimens should be placed as flat as possible.

The location of each mechanical action specimen shall be recorded (using identifying reference – number of test specimen)

7.2 Unloading and drying of test specimens

Mechanical action specimens shall be carefully removed from the load, taking care not to pull, stretch or distort the test specimens.

Base load as well as soil strips shall be dried according to the procedure described in IEC 60456.

Do not dry the mechanical action test specimens in a tumble dryer. The mechanical action test specimens are dried by laying them out flat. Take care not to apply any further mechanical action. If possible, the dot removal test specimens and the fraying test specimens should be carefully flattened by hand to avoid wrinkles.

7.3 Repeating of test procedure

The test procedure is run according to IEC 60456. A test series consists of five test runs.

For each test run new mechanical action test specimens shall be used.

NOTE It is possible to use the same specimens for more than one test run, especially for very low mechanical action.