IEC 63203-204-1

Edition 1.0 2021-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Wearable electronic devices and technologies – Part 204-1: Electronic textile – Test method for assessing washing durability of leisurewear and sportswear e-textile systems

Technologies et dispositifs électroniques prêts-à-porter – Partie 204-1: Textile électronique – Méthode d'essai pour l'évaluation de la durabilité au lavage des systèmes e-textiles des vêtements de sport et de loisirs

IEC 63203-204-1:2021-05(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

IEC 63203-204-1

Edition 1.0 2021-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Wearable electronic devices and technologies – Part 204-1: Electronic textile – Test method for assessing washing durability of leisurewear and sportswear e-textile systems

Technologies et dispositifs électroniques prêts-à-porter – Partie 204-1: Textile électronique – Méthode d'essai pour l'évaluation de la durabilité au lavage des systèmes e-textiles des vêtements de sport et de loisirs

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 59.080.01; 59.080.80

ISBN 978-2-8322-9779-7

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

WEARABLE ELECTRONIC DEVICES AND TECHNOLOGIES –

Part 204-1: Electronic textile – Test method for assessing washing durability of leisurewear and sportswear e-textile systems

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.

International Standard IEC 63203-204-1 has been prepared by IEC technical committee 124: Wearable electronic devices and technologies.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
124/139/FDIS	124/145/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63203 series, published under the general title *Wearable electronic devices and technologies*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.

WEARABLE ELECTRONIC DEVICES AND TECHNOLOGIES –

Part 204-1: Electronic textile – Test method for assessing washing durability of leisurewear and sportswear e-textile systems

1 Scope

This document specifies a household washing durability test method for leisurewear and sportswear e-textile systems. This document includes testing procedures for leisurewear and sportswear products with electrically conductive components and sensors to collect the data of the user.

This document does not cover safety or heat-generation test methods. Products containing other components than those listed in this clause are not covered by this document.

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.

ISO 139, *Textiles – Standard atmospheres for conditioning and testing*

ISO 6330, *Textiles – Domestic washing and drying procedures for textile testing*

EN 16812:2016, *Textiles and textile products – Electrically conductive textiles – Determination of the linear electrical resistance of conductive tracks*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
e-textile system
ETS
product made from textiles and integrated electronics that together perform one or more functions

3.2
conductive textile
textile with electrical conductivity

3.3
leisurewear and sportswear
clothing worn to enjoy leisure and sports (excluding accessories such as watches and glasses)

4 Test method – General

4.1 Checklist before washability test

Check the samples as described in the user manual and confirm that the samples are operating properly according to the manufacturer-provided user manual. Then, measure the resistance and mark the measurement area in accordance with EN 16812:2016, Figure 1, so that the same area can be measured after each washability test. Since the shape of the product varies, select the appropriate method to measure the resistance.

4.2 Washability test conditions

The washing test shall comply with the test procedure in ISO 6330. ISO 6330 offers various test procedures. ETS leisurewear and sportswear for fitness contains a unit that connects the modules and conductive textiles because of the nature of the product. Therefore, the inclusion of a hand-washing condition in the procedure is considered appropriate because it causes less damage to the product.

Conditions for washing the ETS leisurewear and sportswear for fitness are given as follows in this Subclause 4.2 and in 4.3.

The type of washing machine, detergent, washing method, drying method and number of repetitions are selected from methods standardized based on the manufacturer's designated care label. If not specified, the washing machine type is an ISO 6330 reference washing machine Type A, the washing procedure is 4H, and the drying method is procedure A – line dry.

If there is an agreement between the user and the supplier to apply the washing conditions as specified in another international standard, those alternative washing conditions shall be applied instead of those specified in this Subclause 4.2.

4.3 Check of operation before/after washing test

It is necessary to check the operation of the e-textile system under test after repeated washing and drying of the product in accordance with the test conditions. Follow the procedure to check the operation status before washing in accordance with the user manual, double-check the operation status after washing and measure the resistance of the conductive textile to determine whether there is any disconnection (see Annex A).

5 Test procedure

5.1 Pretreatment

5.1.1 The specimens shall be stored for at least 24 h in standard atmosphere conditions: (20,0 ± 2,0) °C and (65,0 ± 5,0) % RH in accordance with ISO 139.

5.1.2 Start operating the product in the manner specified in the user manual. The product shall be checked to ensure it is operating normally, and that it functions in accordance with the user manual. If the features do not work as described, report malfunction.

5.1.3 All detachable components (e.g. connection module or batteries) shall be detached before washing. All embedded components shall remain on the product during wash testing.

5.2 Washing

Wash and dry the specimens in accordance with one of the procedures specified in ISO 6330, following the manufacturer's designated care label.

5.3 Test after washing and drying

After the ETS leisurewear and sportswear for fitness has been processed with washing and drying, prepare to check the performance of the product. Check the operation status and function of the product according to the specified order in the user manual (see example in Figure 1).

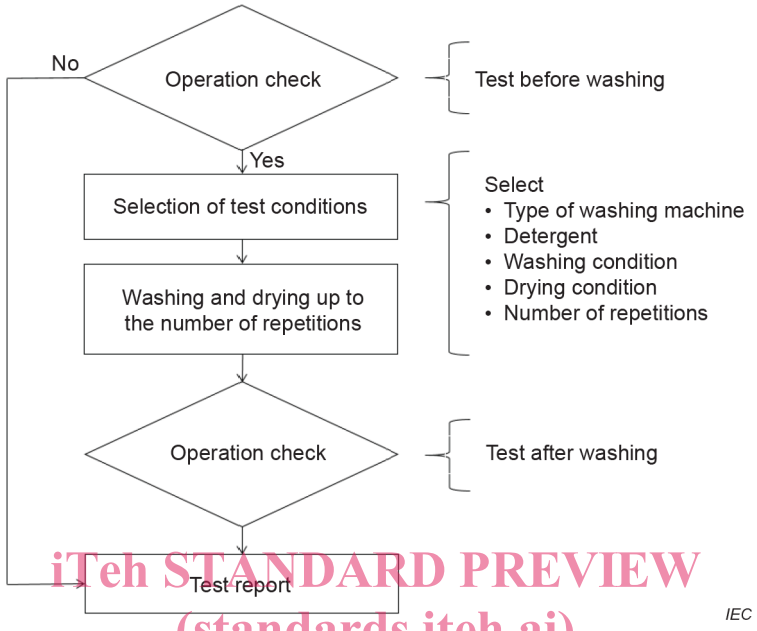


Figure 1 – Flow chart of test procedure

6 Test report

The test reports of every test based on this document shall contain the following information:

a) number and year of publication of this document;
b) product, intended use and type of (detachable) components;
c) operation status of the product in accordance with the user manual;
d) care label instructions (if applicable);
e) washing and drying method, the number of washes;
f) electrical resistance after washing;
g) operation status of the product in accordance with the user manual after the product has been washed.

Annex A
(informative)

Result of studies – Resistance measurement

A.1 Test procedure

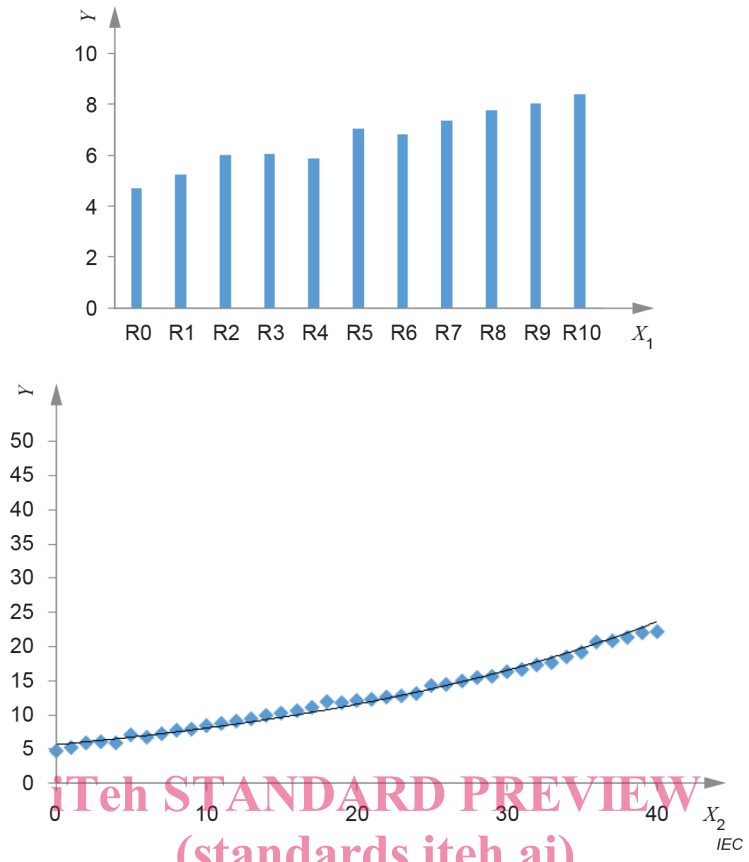
1) Prepare the test specimen, except for electrical components incorporated with batteries for the test pieces provided by the manufacturer.
2) Set measurement points at 100 mm each to the right and left of the centre of conductive areas, and measure the resistance three times at each point.
3) Pretreat the specimen in accordance with ISO 6330. Make sure the pretreatment conditions comply with washing procedures: 6B, standard reference detergent 1 without optical brightener, and procedure C – flat dry.
4) Line dry the pretreated specimen for 8 h, and measure the resistance at the aforesaid points three times.
5) Repeat testing 10 times to measure resistance values at each cycle.

A.2 Test results

After 19 washings under extreme washing conditions, disconnections have been observed. For other products, resistance values before and after 10 washings were slightly increased (see Table A.1 and Figure A.1). It is predictable that the higher the number of washings, the greater the impact on the product's operability, therefore resistance measurement needs to be factored into performance assessment. By testing e-textiles with optimal washing conditions which guarantee the lifespan and performance of the product, some possible defects of e-textiles could be proactively detected.

Table A.1 – Test conditions and results

Samples	Type	Test method - Conditions taken from ISO 6330	Results
A	E-textile	9B-flat dry, laundry test carried out 20 times, and operation check of each laundry test	After 19 times -> sample severed
B	E-textile	9B-flat dry, laundry test carried out 10 times, operation check of each laundry test, electrical resistance measurement	Normal operation, resistance increased
C	E-textile shirt	9B-flat dry, laundry test carried out 20 times, and operation check for each laundry test	Normal operation



Key

X_1 Resistance after number of laundry tests

X_2 Number of laundry tests

Y Electrical resistance (Ω)

Figure A.1 – Test results of resistance measurement after laundry test

_____