

INTERNATIONAL STANDARD

IEC 61189-6

First edition
2006-07

Test methods for electrical materials, interconnection structures and assemblies –

Part 6: Test methods for materials used in manufacturing electronic assemblies

© IEC 2006 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

For price, see current catalogue

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Accuracy, precision and resolution	7
3.1 Accuracy	8
3.2 Precision	8
3.3 Resolution	9
3.4 Report.....	9
3.5 Student's "t" distribution	9
3.6 Suggested uncertainty limits.....	10
4 Catalogue of approved test methods	11
5 P: Preparation/conditioning test methods.....	11
6 V: Visual test methods.....	11
7 D: Dimensional test methods	11
8 C: Chemical test methods.....	11
8.1 Test 6C01: Determination of acid value of liquid soldering flux – potentiometric and visual titration methods.....	11
8.2 Test 6C02: Determination of halides in fluxes, silver chromate method.....	14
8.3 Test 6C03: Solids content, flux.....	16
8.4 Test 6C04: Quantitative determination of halide content in fluxes (chloride and bromide).....	17
8.5 Test 6C05: Qualitative analysis of fluorides and fluxes by spot test.....	22
8.6 Test 6C06: Quantitative determination of fluoride concentration in fluxes	23
8.7 Test 6C07: Acid number of rosin	26
8.8 Test 6C08: Specific gravity.....	26
8.9 Test 6C09: Determination of the percentage of flux on/in flux-coated and/or flux-cored solder	27
8.10 Test 6C10: Flux induced corrosion (copper mirror method).....	28
9 M: Mechanical test methods	30
10 E: Electrical test methods.....	30
11 N: Environmental test methods	30
12 X: Miscellaneous test methods	31
12.1 Test 6X01: Determination of solder powder particle size distribution – Screen method for types 1-4	31
12.2 Test 6X02: Solder powder particle size distribution-measuring microscope method.....	33
12.3 Test 6X03: Solder powder particle size distribution – Optical image analyser method.....	34
12.4 Test 6X04: Solder powder particle size distribution – Measuring laser diffraction method.....	36
12.5 Test 6X05: Determination of maximum solder powder particle size.....	38
12.6 Test 6X06: Solder paste metal content by weight	39

Figure 1 – Chlorides and/or bromides test results	16
Figure 2 – Test equipment of specific gravity (hydrometer reading).....	26
Figure 3 – Flux type classification by copper mirror test.....	30
Table 1 – Student’s “t” distribution	10
Table 2 – Relation between halide content and mass of specimen	20
Table 3 – Mixing ratio from specimen size to water quantity.....	23
Table 4 – Specimen size to chloroform mixture	24
Table 5 – Screen opening	32
Table 6 – Portions of particle sizes by weight % – nominal values	32
Table 7 – Powder particle size distribution record	32
Table 8 – Powder particle size distribution record	34
Table 9 – Powder particle size distribution record (optical analysis).....	36
Table 10 – Powder particle size distribution record	37
Table 11 – Acceptance of powders by particle sizes	38
Table 12 – Test report on solder paste.....	39
Table 13 – Test report on solder paste.....	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TEST METHODS FOR ELECTRICAL MATERIALS, INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 6: Test methods for materials used in manufacturing electronic assemblies

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.

International Standard IEC 61189-6 has been prepared by IEC technical committee 91: Electronic assembly technology.

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

FDIS	Report on voting
91/593/FDIS	91/610/RVD

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

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

This standard should be used in conjunction with the following parts of IEC 61189, under the main title *Test methods for electrical materials, interconnection structures and assemblies*:

Part 1: General test methods and methodology

Part 2: Test methods for materials for interconnection structures

Part 3: Test methods for interconnection structures (printed boards)

Part 4: Test methods for electronic components assembling characteristics

Part 5: Test methods for printed board assemblies,

and also the following standard:

IEC 60068: Environmental testing

The committee has decided that the contents of this publication 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

IEC 61189 relates to test methods for printed boards and printed board assemblies, as well as related materials or component robustness, irrespective of their method of manufacture.

The IEC 61189 series is divided into separate parts, covering information for the designer and the test methodology engineer or technician. Each part has a specific focus; methods are grouped according to their application and numbered sequentially as they are developed and released.

In some instances test methods developed by other TCs (e.g. TC 104) have been reproduced from existing IEC standards in order to provide the reader with a comprehensive set of test methods. When this situation occurs, it will be noted on the specific test method; if the test method is reproduced with minor revision, those paragraphs that are different are identified.

This part of IEC 61189 contains test methods for evaluating materials used in manufacturing electronic assemblies. The methods are self-contained, with sufficient detail and description so as to achieve uniformity and reproducibility in the procedures and test methodologies.

The tests shown in this standard are grouped according to the following principles:

- P: preparation/conditioning methods
- V: visual test methods
- D: dimensional test methods
- C: chemical test methods
- M: mechanical test methods
- E: electrical test methods
- N: environmental test methods
- X: miscellaneous test methods

To facilitate reference to the tests, to retain consistency of presentation, and to provide for future expansion, each test is identified by a number (assigned sequentially) added to the prefix (group code) letter showing the group to which the test method belongs.

The test method numbers have no significance with respect to an eventual test sequence; that responsibility rests with the relevant specification that calls for the method being performed. The relevant specification, in most instances, also describes pass/fail criterion.

The letter and number combinations are for reference purposes, to be used by the relevant specification. Thus "6C02" represents the chemical test method described in this "Part 6" of IEC 61189. In this example, 6 is the part of IEC standard (61189-6), C is the group of methods, and 02 is the test number.

TEST METHODS FOR ELECTRICAL MATERIALS, INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 6: Test methods for materials used in manufacturing electronic assemblies

1 Scope

This part of IEC 61189 is a catalogue of test methods representing methodologies and procedures that can be applied to materials used in manufacturing electronic assemblies.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 61189-1, *Test methods for electrical materials, interconnection structures and assemblies – Part 1: General test methods and methodology*

IEC 61190-1-1, *Attachment materials for electronic assembly – Part 1-1: Requirements for soldering fluxes for high-quality interconnections in electronics assembly*

IEC 61190-1-3, *Attachment materials for electronic assembly – Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications*

ISO 9001, *Quality management systems – Requirements*

ISO 9455 (all parts), *Soft soldering fluxes – Test methods*