SLOVENSKI STANDARD

SIST EN 61788-3:2007

januar 2007

Superprevodnost - 3. del: Meritve kritičnega toka - Enosmerni kritični tok pri Bi-2212 in Bi-2223 oksidnih superprevodnikih, oklopljenih z Ag in/ali zlitinami Ag (IEC 61788-3:2006)

(istoveten EN 61788-3:2006)

Superconductivity - Part 3: Critical current measurement - DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors (IEC 61788-3:2006)

ICS 17.220.20; 29.050

Referenčna številka
SIST EN 61788-3:2007(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61788-3

August 2006

ICS 17.220; 29.050

Supersedes EN 61788-3:2001

English version

Superconductivity
Part 3: Critical current measurement - DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors
(IEC 61788-3:2006)

Supraconductivité
Partie 3: Mesure du courant critique - Courant critique continu des oxydes supraconducteurs Bi-2212 et Bi-2223 avec gaine Ag et/ou en alliage d'Ag
(CEI 61788-3:2006)

Supraleitfähigkeit
Teil 3: Messen des kritischen Stromes - Kritischer Strom (Gleichstrom) von Ag- und/oder Ag-Legierung ummantelten oxidischen Bi-2212 und Bi-2223-Supraleitern
(IEC 61788-3:2006)

This European Standard was approved by CENELEC on 2006-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 61788-3:2006 E

Foreword

The text of document 90/184/FDIS, future edition 2 of IEC 61788-3, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-3 on 2006-06-01.

This European Standard supersedes EN 61788-3:2001.

Modifications made to EN 61788-3:2001 mostly involve wording and essentially include no technical changes.

Examples of technical changes introduced include the voltage lead diameter being smaller than 0,21 mm and the mode of expression for magnetic field accuracy being ± 1 % and ± 0,02 T instead of 1 %. The expression for magnetic field precision has been changed in the same way.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-03-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2009-06-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61788-3:2006 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-815	2000	International Electrotechnical Vocabulary (IEV) Part 815: Superconductivity	-	-

INTERNATIONAL STANDARD

IEC 61788-3

Second edition
2006-04

Superconductivity –

Part 3:
Critical current measurement –
DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors

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 T

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –

Part 3: Critical current measurement – DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors

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 61788-3 has been prepared by IEC technical committee 90: Superconductivity.

This second edition cancels and replaces the first edition published in 2000. Modifications made to the second version mostly involve wording and essentially include no technical changes. Examples of technical changes introduced include the voltage lead diameter being smaller than 0,21 mm and the mode of expression for magnetic field accuracy being ±1 % and ±0,02 T instead of 1 %. The expression for magnetic field precision has been changed in the same way.

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

FDIS	Report on voting
90/184/FDIS	90/190/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.

IEC 61788 consists of the following parts, under the general title *Superconductivity*:

Part 1: Critical current measurement – DC critical current of Cu/Nb-Ti composite superconductors

Part 2: Critical current measurement – DC critical current of Nb_3Sn composite superconductors

Part 3: Critical current measurement – DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors

Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti composite superconductors

Part 5: Matrix to superconductor volume ratio measurement – Copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors

Part 6: Mechanical properties measurement – Room temperature tensile test of Cu/Nb-Ti composite superconductors

Part 7: Electronic characteristic measurements – Surface resistance of superconductors at microwave frequencies

Part 8: AC loss measurements – Total AC loss measurement of Cu/Nb-Ti composite superconducting wires exposed to a transverse alternating magnetic field by a pickup coil method

Part 9: Measurements for bulk high temperature superconductors – Trapped flux density of large grain oxide superconductors

Part 10: Critical temperature measurement – Critical temperature of Nb-Ti, Nb_3Sn, and Bi-system oxide composite superconductors by a resistance method

Part 11: Residual resistance ratio measurement – Residual resistance ratio of Nb_3Sn composite superconductors

Part 12: Matrix to superconductor volume ratio measurement – Copper to non-copper volume ratio of Nb_3Sn composite superconducting wires

Part 13: AC loss measurements – Magnetometer methods for hysteresis loss in Cu/Nb-Ti multifilamentary composites

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

In 1986 J.G. Bednorz and K.A. Mueller discovered that some Perovskite type Cu-containing oxides show superconductivity at temperatures far above those which metallic superconductors have shown. Since then, extensive R & D work on high-temperature oxide superconductors has been and is being made worldwide, and its application to high-field magnet machines, low-loss power transmission, electronics and many other technologies is in progress [1].[1)]

Fabrication technology is essential to the application of high-temperature oxide superconductors. Among high-temperature oxide superconductors developed so far, BiSrCaCu oxide (Bi-2212 and Bi-2223) superconductors have been the most successful at being fabricated into wires and tapes of practical length and superconducting properties. These conductors can be wound into a magnet to generate a magnetic field of several tesla [2]. It has also been shown that Bi-2212 and Bi-2223 conductors can substantially raise the limit of magnetic field generation by a superconducting magnet [3].

In summer 1993, VAMAS-TWA16 started working on the test methods of critical currents in Bi-oxide superconductors. In September 1997, the TWA16 worked out a guideline (VAMAS guideline) on the critical current measurement method for Ag-sheathed Bi-2212 and Bi-2223 oxide superconductors. This pre-standardization work of VAMAS was taken as the base for the IEC standard, described in the present document, on the dc critical current test method of Ag-sheathed Bi-2212 and Bi-2223 oxide superconductors.

The test method covered in this International Standard is intended to give an appropriate and agreeable technical base to those engineers working in the field of superconductivity technology.

The critical current of composite superconductors like Ag-sheathed Bi-oxide superconductors depends on many variables. These variables need to be considered in both the testing and the application of these materials. Test conditions such as magnetic field, temperature and relative orientation of the specimen and magnetic field are determined by the particular application. The test configuration may be determined by the particular conductor through certain tolerances. The specific critical current criterion may be determined by the particular application. It may be appropriate to measure a number of test specimens if there are irregularities in testing.

---

1) The numbers in brackets refer to the bibliography.