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

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61788-3:2008 sisaldab Euroopa standardi EN 61788-3:2006 ingliskeelset teksti.	This Estonian standard EVS-EN 61788-3:2008 consists of the English text of the European standard EN 61788-3:2006.
Standard on kinnitatud Eesti Standardikeskuse 20.02.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 20.02.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 11.08.2006.	Date of Availability of the European standard text 11.08.2006.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

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ICS 17.220, 29.050

Võtmesõnad: bundled conductors, casing, coats, criticality data, current measurement, direct current, electrical engineering, filament (textile fibre), filaments, measurement, silver, silver coating, superconductivity, superconductors

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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)

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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

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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.

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Endorsement notice

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

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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	-	-

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CONTENTS

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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.

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1) The numbers in brackets refer to the bibliography.

SUPERCONDUCTIVITY –

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

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1 Scope

This part of IEC 61788 covers a test method for the determination of the dc critical current of short and straight Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors that have a monolithic structure and a shape of round wire or flat or square tape containing mono- or multicores of oxides.

This method is intended for use with superconductors that have critical currents less than 500 A and *n*-values larger than 5. The test is carried out with and without an applying external magnetic field. For all tests in a magnetic field, the magnetic field is perpendicular to the length of the specimen. In the test of a tape specimen in a magnetic field, the magnetic field is parallel or perpendicular to the wider tape surface (or one surface if square). The test specimen is immersed either in a liquid helium bath or a liquid nitrogen bath during testing. Deviations from this test method that are allowed for routine tests and other specific restrictions are given in this standard.

2 Normative reference

The following referenced document is 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 60050-815:2000, *International Electrotechnical Vocabulary (IEV) – Part 815: Superconductivity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-815, several of which have been repeated her for convenience, and the following apply.

3.1
critical current
I_c
maximum direct current that can be regarded as flowing without resistance

NOTE I_c is a function of magnetic field strength and temperature.

[IEV 815-03-01]

3.2
critical current criterion
I_c criterion
criterion to determine the critical current, I_c, based on the electric field strength, E or the resistivity, ρ

NOTE 1 E = 10 μV/m or E = 100 μV/m is often used as the electric field strength criterion, and $\rho = 10^{-13}$ Ω·m or $\rho = 10^{-14}$ Ω ·m is often used as the resistivity criterion.