

Gi dYfdfYj cXbcgh!' &"XY. 'AYf]hj Y' _f]h] bY[U'hc_ U!'9 bcga Yfb] _f]h] b]'hc_ 'df] gi dYfdfYj cXb]_] 'n'BV' Gb'_ca dcn]hUf]97 '*%&, , !& &\$*\$ £

Superconductivity - Part 2: Critical current measurement - DC critical current of Nb3Sn composite superconductors

Supraleitfähigkeit - Teil 2: Messen des kritischen Stromes. Kritischer Strom (Gleichstrom) von Nb3Sn-Verbundsupraleitern

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Supraconductivité - Partie 2: Mesure du courant critique - Courant critique continu des supraconducteurs composites Nb3Sn

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Ta slovenski standard je istoveten z: EN 61788-2:2007

ICS:

17.220.20	T ^ b} b^Á ^\ dā} ãõ	Measurement of electrical and magnetic quantities
29.050	Superprevodnost in prevodni materiali	Superconductivity and conducting materials

SIST EN 61788-2:2008

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English version

Superconductivity
Part 2: Critical current measurement -
DC critical current of Nb₃Sn composite superconductors
(IEC 61788-2:2006)

Supraconductivité
Partie 2: Mesure du courant critique -
Courant critique continu des
supraconducteurs composites Nb₃Sn
(CEI 61788-2:2006)

Supraleitfähigkeit
Teil 2: Messen des kritischen Stromes -
Kritischer Strom (Gleichstrom)
von Nb₃Sn-Verbundsupraleitern
(IEC 61788-2:2006)

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This European Standard was approved by CENELEC on 2006-12-01. 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

Foreword

The text of document 90/195/FDIS, future edition 2 of IEC 61788-2, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-2 on 2006-12-01.

This European Standard supersedes EN 61788-2:1999.

Modifications made to EN 61788-2:1999 are mostly wording that essentially includes no technical changes and an addition of a new annex (normative Annex D) in which the specifications in the one-mandrel method are described.

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) 2007-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-12-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61788-2:2006 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61788-1 NOTE Harmonized as EN 61788-1:2007 (not modified).

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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.

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

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61788-2

Deuxième édition
Second edition
2006-11

Supraconductivité –

Partie 2:

Mesure du courant critique –

Courant critique continu des

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Part 2:

Critical current measurement –

DC critical current of Nb₃Sn

composite superconductors

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Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –

**Part 2: Critical current measurement –
DC critical current of Nb₃Sn composite superconductors**

FOREWORD

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International Standard IEC 61788-2 has been prepared by IEC technical committee 90: Superconductivity.

This second edition cancels and replaces the first edition published in 1999. Modifications made to the second edition are mostly wording that essentially includes no technical changes and an addition of a new annex (normative Annex D) in which the specifications in the one-mandrel method are described.

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

FDIS	Report on voting
90/195/FDIS	90/199/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.

A list of all parts of the IEC 61788 series, under the general title: *Superconductivity*, can be found on the IEC website.

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.

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INTRODUCTION

The critical currents of composite superconductors are used to establish design limits for applications of superconducting wires. The operating conditions of superconductors in these applications determine much of their behaviour and tests made with the method given in the present standard may be used to provide part of the information needed to determine the suitability of a specific superconductor.

Results obtained from this method may also be used for detecting changes in the superconducting properties of a composite superconductor due to processing variables, handling, ageing or other applications or environmental conditions. This method is useful for quality control, acceptance or research testing if the precautions given in this standard are observed.

The critical current of composite 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, current 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.

The test method covered in this standard is based on that for the determination of the critical current of Cu/Nb-Ti composite superconductors (IEC 61788-1[2]¹⁾ and the VAMAS (Versailles project on advanced materials and standards) prestandardization work on the critical current of Nb₃Sn composite superconductors. The critical current of Nb₃Sn superconductors is known to be highly sensitive to mechanical strain compared to Cu/Nb-Ti superconductors. Hence, some modifications are made on the test procedures which may affect the strain state of a test specimen. See Annex B for the background to these modifications.

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1) Figures in square brackets refer to the Bibliography.

SUPERCONDUCTIVITY –

Part 2: Critical current measurement – DC critical current of Nb₃Sn composite superconductors

1 Scope

This part of IEC 61788 covers a test method for the determination of the d.c. critical current of Nb₃Sn composite superconductors which are fabricated by either the bronze process or the internal tin diffusion process and have a copper/non-copper ratio larger than 0,2.

This method is intended for use with superconductors which have critical currents of less than 1 000 A and n -values larger than 12 under standard test conditions and at magnetic fields of less than or equal to 0,7 times the upper critical magnetic field. The test specimen is immersed in a liquid helium bath at a known temperature during testing. The Nb₃Sn composite test conductor has a monolithic structure with a total round-cross-sectional area that is less than 2 mm². The specimen geometry used in this test method is an inductively coiled specimen. Deviations from this test method which are allowed for routine tests and other specific restrictions are given in this standard.

Nb₃Sn conductors with critical currents above 1 000 A or total cross-sectional areas greater than 2 mm² can be measured with the present method with an anticipated reduction in precision and a more significant self-field effect (see Annex C). Other, more specialized, specimen test geometries may be more appropriate for larger conductor testing which have been omitted from this present standard for simplicity and to retain precision.

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The test method given in this standard should in principle apply to Nb₃Sn composite wires fabricated by any other process. This method is also expected to apply to other superconducting composite wires after some appropriate modifications.

2 Normative references

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*