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**SIST EN 61788-1:2001**

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Superconductivity - Part 1: Critical current measurement - DC critical current of Nb-Ti composite superconductors

Supraleitfähigkeit Teil 1: Messen des kritischen Stromes - Kritischer Strom (Gleichstrom) von Nb-Ti Verbundsupraleitern

(standards.iteh.ai)

Supraconductivité Partie 1: Mesure du courant critique - Courant critique continu de supraconducteurs en composite Nb-Ti

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**Ta slovenski standard je istoveten z: EN 61788-1:2007**

**ICS:**

17.220.20	T ^ b} b^Á ^\ dā} ãöä { æ} ^ç ãö^ ã ä	Measurement of electrical and magnetic quantities
29.050	Superprevodnost in prevodni materiali	Superconductivity and conducting materials

**SIST EN 61788-1:2008**

**en,fr,de**

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English version

**Superconductivity**  
**Part 1: Critical current measurement -**  
**DC critical current of Nb-Ti composite superconductors**  
(IEC 61788-1:2006)

Supraconductivité  
Partie 1: Mesure du courant critique -  
Courant critique continu de  
supraconducteurs en composite Nb-Ti  
(CEI 61788-1:2006)

Supraleitfähigkeit  
Teil 1: Messen des kritischen Stromes -  
Kritischer Strom (Gleichstrom) von Nb-Ti  
Verbundsupraleitern  
(IEC 61788-1:2006)

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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 90/196/FDIS, future edition 2 of IEC 61788-1, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-1 on 2006-12-01.

This European Standard supersedes EN 61788-1:1998.

It includes the following significant technical changes with respect to EN 61788-1:1998:

- the addition of normative Annex C and informative Annex D;
- accuracy and precision statements were converted to uncertainty statements;
- the magnetic field uniformity statement was tightened from  $\pm 2\%$  to be less than the larger of 0,5 % or 0,02 T.

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

<https://standards.iteh.ai/catalog/standards/sist/e0975085-6023-4160-9000-000000000000/iec-61788-1-2006>

The text of the International Standard IEC 61788-1:2006 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 61788-5                      NOTE Harmonized as EN 61788-5:2001 (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	- <sup>1)</sup>	International Electrotechnical Vocabulary (IEV) Part 815: Superconductivity	-	-

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<sup>1)</sup> Undated reference.

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INTERNATIONALE  
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Deuxième édition  
Second edition  
2006-11

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**Supraconductivité –**

**Partie 1:**

**Mesure du courant critique –**

**Courant critique continu de supraconducteurs**

**en composite Nb-Ti**

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**Superconductivity –**

SIST EN 61788-1:2008

<http://standards.iteh.ai/catalog/standards/sist/e0975085-6023-4160->

**Part 1:**

**Critical current measurement –**

**DC critical current of Nb-Ti composite**

**superconductors**

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International Electrotechnical Commission, 3, rue de Varembe, 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

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SUPERCONDUCTIVITY –

**Part 1: Critical current measurement –  
DC critical current of Nb-Ti composite 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.
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International Standard IEC 61788-1 has been prepared by IEC technical committee 90: Superconductivity.

This second edition cancels and replaces the first edition published in 1998. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- the addition of normative Annex C and informative Annex D;
- accuracy and precision statements were converted to uncertainty statements;
- the magnetic field uniformity statement was tightened from  $\pm 2\%$  to be less than the larger of 0,5% or 0,02 T.

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

FDIS	Report on voting
90/196/FDIS	90/201/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.

A list of all parts of IEC 61788 series, published 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 this part of IEC 61788 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.

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## SUPERCONDUCTIVITY –

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

#### 1 Scope

This part of IEC 61788 covers a test method for the determination of the d.c. critical current of either Cu/Nb-Ti composite superconductors that have a copper/superconductor ratio larger than 1 or Cu/Cu-Ni/Nb-Ti wires that have a copper/superconductor ratio larger than 0,9 and a copper alloy (Cu-Ni)/superconductor ratio larger than 0,2, where the diameter of Nb-Ti superconducting filaments is larger than 1  $\mu\text{m}$ . The changes for the Cu/Cu-Ni/Nb-Ti are described in Annex C. The Cu-Ni uses all of the main part of the standard with the exceptions listed in Annex C that replace (and in some cases are counter to) some of the steps in the main text.

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

Test conductors with critical currents above 1 000 A or cross-sectional areas greater than 2 mm<sup>2</sup> could be measured with the present method with an anticipated increase in uncertainty and a more significant self-field effect (see Annex B). 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 a lower uncertainty.

The test method given in this standard is expected to apply to other superconducting composite wires after some appropriate modifications.

#### 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 60050-815, *International Electrotechnical Vocabulary (IEV) – Part 815: Superconductivity*

#### 3 Terms and definitions

For the purposes of this standard, the terms and definitions given in IEC 60050-815, some of which are repeated here for convenience, and the following apply.