

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

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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61788-5:2002 sisaldab Euroopa standardi EN 61788-5:2001 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 18.12.2002 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 03.04.2001.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61788-5:2002 consists of the English text of the European standard EN 61788-5:2001.

This standard is ratified with the order of Estonian Centre for Standardisation dated 18.12.2002 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 03.04.2001.

The standard is available from Estonian standardisation organisation.

ICS 29.050

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English version

**Superconductivity**  
**Part 5: Matrix to superconductor volume ratio measurement -**  
**Copper to superconductor volume ratio**  
**of Cu/Nb-Ti composite superconductors**  
(IEC 61788-5:2000)

Supraconductivité  
Partie 5: Mesure du rapport volumique  
matrice/supraconducteurs -  
Rapport volumique  
cuivre/supraconducteur des composites  
supraconducteurs au Cu/Nb-Ti  
(CEI 61788-5:2000)

Supraleitfähigkeit  
Teil 5: Messung des Verhältnisses von  
Matrixvolumen zu Supraleitervolumen -  
Verhältnis von Kupfervolumen  
zu Supraleitervolumen von  
Cu/Nb Ti-Verbundsupraleitern  
(IEC 61788-5:2000)

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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 90/81/FDIS, future edition 1 of IEC 61788-5, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-5 on 2000-12-01.

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) 2001-10-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2003-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annexes B to D are informative.

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61788-5:2000 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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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) Chapter 815: Superconductivity	-	-

# INTERNATIONAL STANDARD

**IEC**  
**61788-5**

First edition  
2000-12

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## **Superconductivity –**

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

## *Supraconductivité –*

### *Partie 5: Mesure du rapport volumique matrice/supraconducteur – Rapport volumique cuivre/supraconducteur des composites supraconducteurs de Cu/Nb-Ti*



Reference number  
IEC 61788-5:2000(E)

## Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

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- **IEC Web Site** ([www.iec.ch](http://www.iec.ch))

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# INTERNATIONAL STANDARD

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**61788-5**

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International Electrotechnical Commission  
Telefax: +41 22 919 0300

3, rue de Varembé, Geneva, Switzerland  
e-mail: [inmail@iec.ch](mailto:inmail@iec.ch) IEC web site: <http://www.iec.ch>



Commission Electrotechnique Internationale  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SUPERCONDUCTIVITY –

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

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a world-wide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standard. 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. The 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 the IEC on technical matters, prepared by technical committees on which all the National Committees have a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61788-5 has been prepared by IEC technical committee 90: Superconductivity.

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

FDIS	Report on voting
90/81/FDIS	90/87/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 3.

Annex A forms an integral part of this standard.

Annexes B, C and D are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- confirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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

## INTRODUCTION

The copper to superconductor volume ratio of composite superconductors is used mainly to calculate the critical current density of superconducting wires. The test with the method given in this International Standard may be used to provide part of the information needed to determine the suitability of a specific superconductor. Moreover, this method is useful for quality control, acceptance or research testing if the precautions given in this standard are observed.

The test method given in this International Standard is based on the condition that the specific mass of Nb-Ti is known. If the specific mass of Nb-Ti and/or the fraction of Nb barrier are unknown, another method to determine the copper to superconductor volume ratio of composite superconductors is described in annex A.

## SUPERCONDUCTIVITY –

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

#### **1 Scope**

This part of IEC 61788 covers a test method for the determination of copper to superconductor volume ratio of Cu/Nb-Ti composite superconducting wire.

This test method is intended for use with Cu/Nb-Ti composite superconducting wires with a cross-sectional area of  $0,1 \text{ mm}^2$  to  $3 \text{ mm}^2$ , a diameter of the Nb-Ti filament(s) of  $2 \text{ }\mu\text{m}$  to  $200 \text{ }\mu\text{m}$ , and a copper to superconductor volume ratio of 0,5 or more.

The Cu/Nb-Ti composite test conductor discussed in this method has a monolithic structure with a round or rectangular cross-section. This test method is carried out by dissolving the copper with nitric acid. Deviations from this test method that are allowed for routine tests and other specific restrictions are given in this standard.

Cu/Nb-Ti conductors beyond the limits in the cross-sectional area, the filament diameter and the copper to superconductor volume ratio could be measured with this present method with an anticipated reduction in precision. Other, more specialized, specimen test geometries may be more appropriate for conductors beyond the limits and have been omitted from this present standard for simplicity and to retain precision.

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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61788. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61788 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050-815:2000, International Electrotechnical Vocabulary (IEV) – Part 815: Superconductivity

#### **3 Terminology**

For the purposes of this part of IEC 61788, the definitions given in IEC 60050-815 and the following definition are applicable.

##### **3.1**

##### **copper to superconductor volume ratio**

the ratio of the area of the copper stabilizing material to the area without copper consisting of Nb-Ti filaments and their Nb barriers.