

**SLOVENSKI  
STANDARD**

**SIST EN 61788-6:2002**

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

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ICS 29.050; 77.040.10

Referenčna številka  
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EUROPEAN STANDARD

EN 61788-6

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2001

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English version

**Superconductivity**  
**Part 6: Mechanical properties measurement -**  
**Room temperature tensile test of Cu/Nb-Ti composite superconductors**  
(IEC 61788-6:2000)

Supraconductivité  
Partie 6: Mesure des propriétés  
mécaniques -  
Test de tension à température ambiante  
des composites supraconducteurs de  
Cu/Nb-Ti  
(CEI 61788-6:2000)

Supraleitfähigkeit  
Teil 6: Messung der mechanischen  
Eigenschaften -  
Messung der Zugfestigkeit von  
Cu/Nb Ti-Verbundsupraleitern mit  
Raumtemperatur  
(IEC 61788-6:2000)

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This European Standard was approved by CENELEC on 2000-12-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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 90/82/FDIS, future edition 1 of IEC 61788-6, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-6 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, annex ZA is normative and annex A is informative.  
Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61788-6:2000 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

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	-	-
ISO 376	1999	Metallic materials - Calibration of force-proving instruments used for the verification of uniaxial testing machines	-	-
ISO 6892	1998	Metallic materials - Tensile testing at ambient temperature	-	-
ISO 7500-1	1999	Metallic materials - Verification of static uniaxial testing machines Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system	-	-
ISO 9513	1999	Metallic materials - Calibration of extensometers used in uniaxial testing	-	-

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# INTERNATIONAL STANDARD

IEC  
61788-6

First edition  
2000-12

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## Superconductivity –

### Part 6:

### Mechanical properties measurement –

### Room temperature tensile test of Cu/Nb-Ti

composite superconductors

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### Supraconductivité –

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### Partie 6:

### Mesure des propriétés mécaniques –

### Test de tension à température ambiante

### des composites supraconducteurs de Cu/Nb-Ti

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SUPERCONDUCTIVITY –

**Part 6: Mechanical properties measurement –  
Room temperature tensile test 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 co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standards and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 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 61788-6 has been prepared by IEC technical committee 90: Superconductivity.

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

FDIS	Report on voting
90/82/FDIS	90/88/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 is 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

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

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

## INTRODUCTION

The Cu/Nb-Ti superconductive composite wires currently in use are multifilamentary composite material with a matrix that functions as a stabilizer and supporter, in which ultrafine superconductor filaments are embedded. An Nb-40~55 mass% Ti alloy is used as the superconductive material, while oxygen free copper and aluminum of high purity are employed as the matrix material. Commercial composite superconductors have a high current density and a small cross-sectional area. The major application of the composite superconductors is to build superconducting magnets. While the magnet is being manufactured, complicated stresses are applied to its windings and, while it is being energized, a large electromagnetic force is applied to the superconducting wires because of its high current density. It is therefore indispensable to determine the mechanical properties of the superconductive wires, of which the windings are made.

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## SUPERCONDUCTIVITY -

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

#### 1 Scope

This part of IEC 61788 covers a test method detailing the tensile test procedures to be carried out on Cu/Nb-Ti superconductive composite wires at room temperature.

This test is used to measure modulus of elasticity, 0,2 % proof strength of the composite due to yielding of the copper component, and tensile strength.

The value for percentage elongation after fracture and the second type of 0,2 % proof strength due to yielding of the Nb-Ti component shall serve only as a reference (see clauses A.1 and A.2).

The sample covered by this test procedure should have a round or rectangular cross-section with an area of 0,15 mm<sup>2</sup> to 2 mm<sup>2</sup> and a copper to superconductor volume ratio of 1,0 to 8,0 without the insulating coating.

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#### 2 Normative references

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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*

ISO 6892:1998, *Metallic materials - Tensile testing at ambient temperature*

ISO 376:1999, *Metallic materials - Calibration of force-proving instruments used for the verification of uniaxial testing machines*

ISO 7500-1:1999, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system*

ISO 9513:1999, *Metallic materials - Calibration of extensometers used in uniaxial testing*