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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 61788-6 has been prepared by IEC technical committee 90: Superconductivity.

This second edition cancels and replaces the first edition published in 2000. It constitutes a technical revision.

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

– the minimum distance between grips was changed from 100 mm to 60 mm;
– accuracy and precision statement were converted to uncertainty statements.

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

FDIS	Report on voting
90/207/FDIS	90/209/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, 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- withdrawn;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.

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. A Nb-40~55 mass % Ti alloy is used as the superconductive material, while oxygen-free copper and aluminium 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.

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 serves only as a reference (see Clauses A.1 and A.2).

The sample covered by this test procedure has a round or shaped angular cross-section with an area of 0,15 mm^2 to 2 mm^2 and a copper to superconductor volume ratio of 1,0 to 8,0 and without the insulating coating.

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*

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

ISO 6892, *Metallic materials – Tensile testing at ambient temperature*

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

ISO 9513, *Metallic materials – Calibration of extensometers used in uniaxial testing*