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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Superconductivity – Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti and Nb_3Sn composite superconductors

Supraconductivité – Partie 4: Mesurage du rapport de résistance résiduelle – Rapport de résistance résiduelle des composites supraconducteurs de Nb-Ti et de Nb_3Sn

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SUPERCONDUCTIVITY –

Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti and Nb_3Sn composite superconductors

FOREWORD

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International Standard IEC 61788-4 has been prepared by IEC technical committee 90: Superconductivity.

This fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

a) the unification of similar test methods for residual resistance ratio (RRR) of Nb-Ti and Nb_3Sn composite superconductors, the latter of which is described in IEC 61788-11.

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

FDIS	Report on voting
90/359/FDIS	90/360/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 stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

Copper, Cu/Cu-Ni or aluminium is used as matrix material in Nb-Ti and Nb_3Sn composite superconductors and works as an electrical shunt when the superconductivity is interrupted. It also contributes to recovery of the superconductivity by conducting heat generated in the superconductor to the surrounding coolant. The cryogenic-temperature resistivity of copper is an important quantity, which influences the stability and AC losses of the superconductor. The residual resistance ratio is defined as a ratio of the resistance of the superconductor at room temperature to that just above the superconducting transition.

This part of IEC 61788 specifies the test method for residual resistance ratio of Nb-Ti and Nb_3Sn composite superconductors. The curve method is employed for the measurement of the resistance just above the superconducting transition. Other methods are described in A.3.

SUPERCONDUCTIVITY –

Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti and Nb_3Sn composite superconductors

1 Scope

This part of IEC 61788 specifies a test method for the determination of the residual resistance ratio (RRR) of Nb-Ti and Nb_3Sn composite superconductors with Cu, Cu-Ni, Cu/Cu-Ni and Al matrix. This method is intended for use with superconductor specimens that have a monolithic structure with rectangular or round cross-section, RRR value less than 350, and cross-sectional area less than 3 mm^2. In the case of Nb_3Sn, the specimens have received a reaction heat-treatment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 – Part 815: Superconductivity* (available at: www.electropedia.org)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-815 and the following apply.

3.1
residual resistance ratio
RRR
ratio of resistance at room temperature to the resistance just above the superconducting transition

Note 1 to entry: This note applies to the French language only.

Note 2 to entry: In this part of IEC 61788 for Nb-Ti and Nb_3Sn composite superconductors, the room temperature is defined as 293 K (20 °C), and the residual resistance ratio is obtained in Formula (1), where the resistance (R_1) at 293 K is divided by the resistance (R_2) just above the superconducting transition.

$$r_{RRR} = \frac{R_1}{R_2} \tag{1}$$

Here r_{RRR} is a value of the residual resistance ratio, R_2 is a value of the resistance measured in a strain-free condition and zero external magnetic field.

Figure 1 shows schematically a resistance versus temperature curve acquired on a specimen while measuring the cryogenic resistance.