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Standards

Irish Standard
I.S. EN IEC 61788-4:2020

Superconductivity - Part 4: Residual resistance ratio measurement - Residual resistance ratio of Nb-Ti and Nb₃Sn composite superconductors

I.S. EN IEC 61788-4:2020

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National Foreword

I.S. EN IEC 61788-4:2020 is the adopted Irish version of the European Document EN IEC 61788-4:2020, Superconductivity - Part 4: Residual resistance ratio measurement - Residual resistance ratio of Nb-Ti and Nb₃Sn composite superconductors

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EN IEC 61788-4

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2020

ICS 17.220.20; 29.050

Supersedes EN 61788-4:2016 and all of its amendments
and corrigenda (if any)

English Version

**Superconductivity - Part 4: Residual resistance ratio
measurement - Residual resistance ratio of Nb-Ti and Nb₃Sn
composite superconductors
(IEC 61788-4:2020)**

Supraconductivité - Partie 4: Mesurage du rapport de
résistance résiduelle - Rapport de résistance résiduelle des
composites supraconducteurs de Nb-Ti et de Nb₃Sn
(IEC 61788-4:2020)

Supraleitfähigkeit - Teil 4: Messung des
Restwiderstandsverhältnisses - Restwiderstandsverhältnis
von Nb-Ti und Nb₃Sn Verbundsupraleitern
(IEC 61788-4:2020)

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EN IEC 61788-4:2020 (E)

European foreword

The text of document 90/448/FDIS, future edition 5 of IEC 61788-4, prepared by IEC/TC 90 "Superconductivity" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61788-4:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-01-24
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Annex ZA (normative)

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<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-815	-	International Electrotechnical Vocabulary - Part 815: Superconductivity	-	-

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IEC 61788-4

Edition 5.0 2020-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Superconductivity –
Part 4: Residual resistance ratio measurement – Residual resistance ratio of
Nb-Ti and Nb₃Sn composite superconductors**

**Supraconductivité –
Partie 4: Mesurage du rapport de résistance résiduelle – Rapport de résistance
résiduelle des composites supraconducteurs de Nb-Ti et de Nb₃Sn**



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IEC 61788-4

Edition 5.0 2020-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Superconductivity –

Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti and Nb₃Sn composite superconductors

Supraconductivité –

Partie 4: Mesurage du rapport de résistance résiduelle – Rapport de résistance résiduelle des composites supraconducteurs de Nb-Ti et de Nb₃Sn

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –**Part 4: Residual resistance ratio measurement –
Residual resistance ratio of Nb-Ti and Nb₃Sn
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International Standard IEC 61788-4 has been prepared by IEC technical committee 90: Superconductivity.

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

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

- a) change in the suitable distance of voltage taps on the specimen for reliable measurement,
- b) new report on the result of the round robin test of the residual resistance ratio of Nb₃Sn superconductors that proves the validity of the measurement method in this standard,
- c) revision of the confusing definitions of the copper ratio and copper fraction.

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

FDIS	Report on voting
90/448/FDIS	90/451/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.

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INTRODUCTION

Copper, Cu/Cu-Ni or aluminium is used as matrix material in Ni-Ti and Nb₃Sn 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 document specifies the test method for residual resistance ratio of Nb-Ti and Nb₃Sn composite superconductors. The curve method is employed for the measurement of the resistance just above the superconducting transition. Other methods are described in Clause A.3.

SUPERCONDUCTIVITY –

Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti and Nb₃Sn 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 Nb₃Sn composite superconductors with Cu, Cu-Ni, Cu/Cu-Ni and Al matrix in a strain-free condition and zero external magnetic field. 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 mm². In the case of Nb₃Sn, the specimens have received a reaction heat-treatment.

2 Normative references

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IEC 60050-815, *International Electrotechnical Vocabulary (IEV) – 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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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 document for Nb-Ti and Nb₃Sn 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.

$$r_{\text{RRR}} = \frac{R_1}{R_2} \quad (1)$$

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