SLOVENSKI STANDARD
SIST EN IEC 61788-4:2020

01-julij-2020

Nadomešča:
SIST EN 61788-4:2016

Superprevodnost - 4. del: Meritve razmerja preostale upornosti - Preostala upornost za superprevodnike iz kompozita Nb-Ti in Nb3Sn (IEC 61788-4:2020)

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

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

Ta slovenski standard je istoveten z: **EN IEC 61788-4:2020**

ICS:

17.200.20	Instrumenti za merjenje temperature	Temperature-measuring instruments
29.050	Superprevodnost in prevodni materiali	Superconductivity and conducting materials

SIST EN IEC 61788-4:2020 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61788-4

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)

This European Standard was approved by CENELEC on 2020-04-24. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-04-24

This document supersedes EN 61788-4:2016 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61788-4:2020 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

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

IEC 61788-4

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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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FOREWORD

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 Nb_3Sn 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.

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Copper, Cu/Cu-Ni or aluminium is used as matrix material in Ni-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 document 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 Clause 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 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 mm^2. In the case of Nb_3Sn, the specimens have received a reaction heat-treatment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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* (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 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.

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