



BSI Standards Publication

Superconductivity

Part 5: Matrix to superconductor volume ratio measurement — Copper to superconductor volume ratio of Cu/Nb-Ti composite superconducting wires

National foreword

This British Standard is the UK implementation of EN 61788-5:2013. It is identical to IEC 61788-5:2013. It supersedes BS EN 61788-5:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee L/-/90, Super Conductivity.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Date	Text affected
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English version

**Superconductivity -
 Part 5: Matrix to superconductor volume ratio measurement -
 Copper to superconductor volume ratio of Cu/Nb-Ti composite
 superconducting wires
 (IEC 61788-5:2013)**

Supraconductivité -
 Partie 5 : Mesure du rapport volumique
 matrice/supraconducteur -
 Rapport volumique
 cuivre/supraconducteur des fils en
 composite supraconducteur Cu/Nb-Ti
 (CEI 61788-5:2013)

Supraleitfähigkeit -
 Teil 5: Messung des Verhältnisses von
 Matrixvolumen zu Supraleitervolumen -
 Verhältnis von Kupfervolumen zu
 Supraleitervolumen von Cu/Nb-Ti
 Verbundsupraleiterdrähten
 (IEC 61788-5:2013)

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 90/321/FDIS, future edition 2 of IEC 61788-5, prepared by IEC/TC 90 "Superconductivity" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61788-5:2013.

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) 2014-04-02
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-07-02

This document supersedes EN 61788-5:2001.

EN 61788-5:2013 includes the following significant technical changes with respect to EN 61788-5:2001:

The main revisions are the addition of two new annexes, "Uncertainty considerations" (Annex E) and "Uncertainty evaluation in test method of copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors" (Annex F).

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

Endorsement notice

The text of the International Standard IEC 61788-5:2013 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, 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.

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	Series	International Electrotechnical Vocabulary (IEV)	-	-

CONTENTS

INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Principle	7
5 Chemicals	7
6 Apparatus.....	7
7 Measurement procedure.....	8
7.1 Quantity of specimen.....	8
7.2 Removal of insulating cover material	8
7.3 Cleaning.....	8
7.4 Drying	8
7.5 Measurement of specimen mass and its repetition.....	8
7.6 Dissolving copper	8
7.7 Cleaning and drying the Nb-Ti filaments	9
7.8 Measurement of dissolved specimen mass and its repetition	9
7.9 Procedural repetition for second specimen	10
8 Calculation of results	10
9 Uncertainty of the test method	10
10 Test report.....	11
10.1 Identification of test specimen	11
10.2 Report of copper to superconductor volume ratio.....	11
10.3 Report of test conditions.....	11
Annex A (normative) Copper to superconductor volume ratio – copper mass method.....	12
Annex B (informative) Specific mass depending on Nb-Ti fraction.....	14
Annex C (information) Mechanical removal of insulating cover materials	15
Annex D (informative) Second etch of specimen	16
Annex E (informative) Uncertainty considerations	17
Annex F (informative) Uncertainty evaluation in the test method of copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors.....	22
Table B.1 – Specific mass of Nb-Ti	14
Table E.1 – Output signals from two nominally identical extensometers	18
Table E.2 – Mean values of two output signals	18
Table E.3 – Experimental standard deviations of two output signals.....	18
Table E.4 – Standard uncertainties of two output signals	19
Table E.5 – Coefficient of variations of two output signals.....	19

INTRODUCTION

The copper to superconductor volume ratio of composite superconductors is used mainly to calculate the critical current density of superconducting wires. The test with the method given in this International Standard may be used to provide part of the information needed to determine the suitability of a specific superconductor. Moreover, this method is useful for quality control, acceptance or research testing if the precautions given in this standard are observed.

The test method given in this International Standard is based on the condition that the specific mass of Nb-Ti is known or the Nb-Ti alloy fraction is known and Annex B can be used to estimate the specific mass. If the specific mass of Nb-Ti is unknown and the Nb-Ti alloy fraction is unknown and/or the fraction of Nb barrier is unknown, another method to determine the copper to superconductor volume ratio of composite superconductors is described in Annex A.

SUPERCONDUCTIVITY –

Part 5: Matrix to superconductor volume ratio measurement – Copper to superconductor volume ratio of Cu/Nb-Ti composite superconducting wires

1 Scope

This part of IEC 61788 covers a test method for the determination of copper to superconductor volume ratio of Cu/Nb-Ti composite superconducting wires.

This test method and the alternate method in Annex A are intended for use with Cu/Nb-Ti composite superconducting wires with a cross-sectional area of 0,1 mm² to 3 mm², a diameter of the Nb-Ti filament(s) of 2 μm to 200 μm, and a copper to superconductor volume ratio of 0,5 or more.

The Cu/Nb-Ti composite test conductor discussed in this method has a monolithic structure with a round or rectangular cross-section. This test method is carried out by dissolving the copper with nitric acid. Deviations from this test method that are allowed for routine tests and other specific restrictions are given in this standard.

Cu/Nb-Ti composite superconducting wires beyond the limits in the cross-sectional area, the filament diameter and the copper to superconductor volume ratio could be measured with this present method with an anticipated reduction of uncertainty. Other, more specialized, specimen test geometries may be more appropriate for conductors beyond the limits and have been omitted from this present standard for simplicity and to retain low uncertainty.

The test method given in this standard is expected to apply to other superconducting composite wires after some appropriate modifications.

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 (all parts), *International Electrotechnical Vocabulary* (available at <<http://www.electropedia.org>>)

3 Terms and definitions

For the purposes of this document, the definitions given in IEC 60050-815 as well as the following definition apply.

3.1

copper to superconductor volume ratio

ratio of the volume of the copper stabilizing material to the volume without copper consisting of Nb-Ti filaments and their Nb barriers