
Superconductivity - Part 13: AC loss measurements - Magnetometer methods for hysteresis loss in Cu/Nb-Ti multifilamentary composites

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EUROPEAN STANDARD

EN 61788-13

NORME EUROPÉENNE

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English version

Superconductivity
Part 13: AC loss measurements -
Magnetometer methods for hysteresis loss
in Cu/Nb-Ti multifilamentary composites
(IEC 61788-13:2003)

Supraconductivité
Partie 13 : Mesure des pertes
en courant alternatif -
Méthodes de mesure par magnétomètre
des pertes par hystérésis
dans les composites multifilamentaires
de Cu/Nb-Ti
(CEI 61788-13:2003)

Supraleitfähigkeit
Teil 13: Messung der
Wechselstromverluste -
Magnetometerverfahren zur
Messung der Hystereseverluste
von Cu/Nb-Ti-Multifilament-
Verbundsupraleitern
(IEC 61788-13:2003)

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This European Standard was approved by CENELEC on 2003-06-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 90/137/FDIS, future edition 1 of IEC 61788-13, prepared by IEC TC 90, Superconductivity, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61788-13 on 2003-06-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-06-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annex A is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61788-13:2003 was approved by CENELEC as a European Standard without any modification.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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	2000	International Electrotechnical Vocabulary (IEV) Chapter 815: Superconductivity	-	-
IEC 61788-5	- ¹⁾	Superconductivity Part 5: Matrix to superconductor volume ratio measurement - Copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors	EN 61788-5	2001 ²⁾

[SIST EN 61788-13:2003](https://standards.iteh.ai/catalog/standards/sist/3dbcc076-afe6-4265-b6f1-0fa3e2de15e/sist-en-61788-13-2003)

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1) Undated reference.

2) Valid edition at date of issue.

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61788-13

Première édition
First edition
2003-05

Supraconductivité –

Partie 13:

**Mesure des pertes en courant alternatif –
Méthodes de mesure par magnétomètre**

**des pertes par hystérésis dans les composites
multifilamentaires de Cu/Nb-Ti**
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Superconductivity –

Part 13:

AC loss measurements –

**Magnetometer methods for hysteresis loss
in Cu/Nb-Ti multifilamentary composites**

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –

**Part 13: AC loss measurements –
Magnetometer methods for hysteresis loss
in Cu/Nb-Ti multifilamentary composites**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61788-13 has been prepared by IEC technical committee 90: Superconductivity.

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

FDIS	Report on voting
90/137/FDIS	90/141/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.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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

INTRODUCTION

IEC technical committee 90 proposes magnetometer and pickup coil methods for measuring the AC losses of Cu/Nb-Ti composite superconducting wires in transverse time-varying magnetic fields. These represent initial steps in standardization of methods for measuring the various contributions to AC loss in transverse fields, the most frequently encountered configuration.

It was decided to split the initial proposal mentioned above into two documents covering two standard methods. One of them describes the magnetometer method for hysteresis loss and low frequency (or sweep rate) total AC loss measurement in a slowly varying magnetic field, and the other describes the pickup coil method for total AC loss measurement in higher frequency (or sweep rate) magnetic fields. The frequency range is 0 Hz – 0,06 Hz for the magnetometer method and 0,005 Hz – 1 Hz for the pickup-coil method. The overlap between 0,005 Hz and 0,06 Hz is a complementary frequency range for the two methods.

This standard deals with the magnetometer method.

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SUPERCONDUCTIVITY –

Part 13: AC loss measurements – Magnetometer methods for hysteresis loss in Cu/Nb-Ti multifilamentary composites

1 Scope

This part of IEC 61788 describes considerations for the measurement of hysteretic loss in Cu/Nb-Ti multifilamentary composites using DC- or low-ramp-rate magnetometry. This standard focuses on the measurement of hysteretic loss in multifilamentary Cu/Nb-Ti composite conductors. Measurements are assumed to be on round wires with temperatures at or near 4,2 K. DC or low-ramp-rate magnetometry will be performed using either a superconducting quantum interference device (SQUID magnetometer) or a vibrating-sample magnetometer (VSM). In case differences between the calibrated magnetometer results are noted, the VSM results, extrapolated to zero ramp rate, will be taken as definitive.

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 60050-815:2000, *International Electrotechnical Vocabulary (IEV) – Part 815: Superconductivity* <https://standards.iteh.ai/catalog/standards/sist/3dbcc076-afe6-4265-b6f1-0fa3e2de15e/sist-en-61788-13-2003>

IEC 61788-5, *Superconductivity – Part 5: Matrix to superconductor volume ratio measurement – Copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors*

3 Terms and definitions

For the purposes of this part of IEC 61788, the definitions given in IEC 60050-815 apply, together with the following.

3.1

AC loss

P

power dissipated in a composite superconductor due to application of a time-varying magnetic field or electric current

[IEV 815-04-54]

NOTE The AC loss per magnetic field cycle is designated *Q*. Although all such loss is inevitably "hysteretic" in the general sense, the AC loss in a superconducting composite is assumed to be separable into "hysteresis-", "eddy-current-", and "coupling-" loss components, as defined below (see Note 1 and Note 2 of IEC 815-04-54).