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Standards

Irish Standard
I.S. EN 61788-13:2012

Superconductivity -- Part 13: AC loss measurements - Magnetometer methods for hysteresis loss in superconducting multifilamentary composites (IEC 61788-13:2012 (EQV))

I.S. EN 61788-13:2012

Incorporating amendments/corrigenda issued since publication:

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English version

**Superconductivity -
Part 13: AC loss measurements -
Magnetometer methods for hysteresis loss in superconducting
multifilamentary composites
(IEC 61788-13:2012)**

Supraconductivité -
Partie 13: Mesure des pertes
en courant alternatif -
Méthodes de mesure par magnétomètre
des pertes par hystérésis dans les
composites multifilamentaires
supraconducteurs
(CEI 61788-13:2012)

Supraleitfähigkeit -
Teil 13: Messung der
Wechselstromverluste -
Magnetometerverfahren zur Messung
der Hystereseverluste von supraleitenden
Multifilament-Verbundleitern
(IEC 61788-13:2012)

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 90/302/FDIS, future edition 2 of IEC 61788-13, prepared by IEC/TC 90 "Superconductivity" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61788-13:2012.

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) 2013-05-29
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-08-29

This document supersedes EN 61788-13:2003.

EN 61788-13:2012 includes the following significant technical changes with respect to EN 61788-13:2003:

- to extend to the measurement of superconductors in general, in various sample sizes and shapes, and at temperatures other than 4,2 K;
- to use the word "uncertainty" for all quantitative (associated with a number) statistical expressions and eliminate the quantitative use of "precision" and "accuracy" in accordance with the decision at the June 2006 IEC/TC 90 meeting in Kyoto.

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Endorsement notice

The text of the International Standard IEC 61788-13:2012 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	Series	International Electrotechnical Vocabulary (IEV)	-	-
IEC 61788-5	-	Superconductivity - Part 5: Matrix to superconductor volume ratio measurement - Copper to superconductor volume ratio of Cu/Nb-Ti composite superconductors	EN 61788-5	-

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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 General specifications	8
4.1 Target uncertainty	8
4.2 Uncertainty and uniformity of the applied field	8
4.3 VSM calibration	8
4.4 Temperature.....	9
4.5 Specimen length.....	9
4.6 Specimen orientation and demagnetization effects	9
4.7 Normalization volume	9
4.8 Mode of field cycling or sweeping	9
5 The VSM method of measurement.....	10
5.1 General.....	10
5.2 VSM measurement principle	10
5.3 VSM specimen preparation.....	10
5.4 VSM measurement conditions and calibration	12
5.4.1 Field amplitude	12
5.4.2 Direction of applied field	12
5.4.3 Rate of change of the applied field (sweep rate)	12
5.4.4 Waveform of the field change	12
5.4.5 Specimen size and shape correction.....	12
5.4.6 Allowance for addendum (background subtraction)	13
5.4.7 Data point density.....	13
6 Test report.....	13
6.1 General.....	13
6.2 Initiation of the test.....	13
6.3 Technical details	13
Annex A (informative) The SQUID method of measurement	15
Annex B (normative) Extension of the standard to the measurement of superconductors in general	16
Annex C (informative) Uncertainty considerations	18
Bibliography.....	23
Figure 1 – A typical experimental setup of VSM measurement	11
Figure 2 – Three alternative specimen configurations for the VSM measurement	11
Table C.1 – Output signals from two nominally identical extensometers	19
Table C.2 – Mean values of two output signals	19
Table C.3 – Experimental standard deviations of two output signals	19
Table C.4 – Standard uncertainties of two output signals	20
Table C.5 – Coefficient of variations of two output signals	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –

Part 13: AC loss measurements – Magnetometer methods for hysteresis loss in superconducting multifilamentary composites

FOREWORD

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

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

Modifications made to the second edition are

- to extend to the measurement of superconductors in general, in various sample sizes and shapes, and at temperatures other than 4,2 K,
- to use the word "uncertainty" for all quantitative (associated with a number) statistical expressions and eliminate the quantitative use of "precision" and "accuracy" in accordance with the decision at the June 2006 IEC/TC90 meeting in Kyoto.

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

FDIS	Report on voting
90/302/FDIS	90/306/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, 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 web site 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.

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 – 60 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.

SUPERCONDUCTIVITY –

Part 13: AC loss measurements – Magnetometer methods for hysteresis loss in superconducting 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 international standard specifies a method of 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, See Annex A.) 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. Extension to the measurement of superconductors in general is given in Annex B.

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

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 terms and definitions given in IEC 60050-815, together with the following terms and definitions, apply.

3.1

AC loss

P

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

Note 1 to entry: 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 60050-815:2000, 815-04-54).

[SOURCE: IEC 60050-815:2000, 815-04-54, modified – The original two notes have been replaced by a new note to entry.]

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