SVENSK STANDARD SS-EN 61788-21

Fastställd	Utgåva	Sida	Ansvarig kommitté
2015-09-15	1	1 (1+15)	SEK Elektro-tekniska rådet

Supraledning – Del 21: Supraledande tråd – Provning av ledningstråd – Allmänna egenskaper och vägledning

Superconductivity – Part 21: Superconducting wires – Test methods for practical superconducting wires – General characteristics and guidance

Som svensk standard gäller europastandarden EN 61788-21:2015. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61788-21:2015.

Nationellt förord

Europastandarden EN 61788-21:2015

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC

– **IEC 61788-21, First edition, 2015 - Superconductivity - Part 21: Superconducting wires - Test methods for practical superconducting wires - General characteristics and guidance**

utarbetad inom International Electrotechnical Commission, IEC.

ICS 17.220.00; 29.050.00; 77.040.10

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61788-21

July 2015

ICS 17.220; 29.050; 77.040.10

English Version

Superconductivity - Part 21: Superconducting wires - Test methods for practical superconducting wires - General characteristics and guidance (IEC 61788-21:2015)

Supraconductivité - Partie 21: Fils supraconducteurs - Méthodes d'essai pour fils supraconducteurs à usage pratique - Caractéristiques générales et lignes directrices (IEC 61788-21:2015)

Supraleitfähigkeit - Teil 21: Supraleiterdrähte - Prüfverfahren für technische Supraleiterdrähte - Allgemeine Eigenschaften und Anleitung (IEC 61788-21:2015)

This European Standard was approved by CENELEC on 2015-06-23. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

Ref. No. EN 61788-21:2015 E

SEK Svensk Elstandard

European foreword

The text of document 90/353/FDIS, future edition 1 of IEC 61788-21, prepared by IEC/TC 90 "Superconductivity" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61788-21:2015.

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) 2016-03-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-06-23

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 61788-21:2015 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 1 When 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	series	International electrotechnical vocabulary	-	-
IEC 61788-1	-	Superconductivity - Part 1: Critical current measurement - DC critical current of Nb-Ti composite superconductors	EN 61788-1	-
IEC 61788-2	-	Superconductivity - Part 2: Critical current measurement - DC critical current of Nb_3Sn composite superconductors	EN 61788-2	-
IEC 61788-3	-	Superconductivity - Part 3: Critical current measurement - DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors	EN 61788-3	-
IEC 61788-4	-	Superconductivity - Part 4: Residual resistance ratio measurement - Residual resistance ratio of Nb-Ti composite superconductors	EN 61788-4	-
IEC 61788-5	-	Superconductivity - Part 5: Matrix to superconductor volume ratio measurement - Copper to superconductor volume ratio of Cu/Nb-Ti composite superconducting wires	EN 61788-5	-
IEC 61788-6	-	Superconductivity - Part 6: Mechanical properties measurement - Room temperature tensile test of Cu/Nb-Ti composite superconductors	EN 61788-6	-

Publication	Year	Title	EN/HD	Year
IEC 61788-8	-	Superconductivity - Part 8: AC loss measurements - Total AC loss measurement of round superconducting wires exposed to a transverse alternating magnetic field at liquid helium temperature by a pickup coil method	EN 61788-8	-
IEC 61788-10	-	Superconductivity - Part 10: Critical temperature measurement - Critical temperature of composite superconductors by a resistance method	EN 61788-10	-
IEC 61788-11	-	Superconductivity - Part 11: Residual resistance ratio measurement - Residual resistance ratio of Nb_3Sn composite superconductors	EN 61788-11	-
IEC 61788-12	-	Superconductivity - Part 12: Matrix to superconductor volume ratio measurement - Copper to non-copper volume ratio of Nb_3Sn composite superconducting wires	EN 61788-12	-
IEC 61788-13	-	Superconductivity - Part 13: AC loss measurements - Magnetometer methods for hysteresis loss in superconducting multifilamentary composites	EN 61788-13	-
IEC 61788-18	-	Superconductivity - Part 18: Mechanical properties measurement - Room temperature tensile test of Ag- and/or Ag alloy-sheathed Bi-2223 and Bi-2212 composite superconductors	EN 61788-18	-
IEC 61788-19	-	Superconductivity - Part 19: Mechanical properties measurement - Room temperature tensile test of reacted Nb_3Sn composite superconductors	EN 61788-19	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SUPERCONDUCTIVITY –

Part 21: Superconducting wires – Test methods for practical superconducting wires – General characteristics and guidance

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61788-21 has been prepared by IEC technical committee 90: Superconductivity.

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

FDIS	Report on voting
90/353/FDIS	90/354/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 the parts in 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 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

Superconducting (SC) wires are a central and often enabling technology of many important industrial products. Consensus-based standards for SC wires greatly facilitate the creation of procurement specifications, design and engineering of components, certification of quality, description of operating devices, and generalization of use in industrial technologies.

This part of IEC 61788 is ranked as a first priority for both producers and users of superconducting technology: It provides the measurement methods and test procedures for properties critical to use. Adherence to normative information assists the development of commercial markets and the distribution of products. Standardization in this regard is meant to provide common access to, and unarguable reference information about, characteristics that are most important for superconductor-based technologies.

This part of IEC 61788 includes the measurement principles and measurement techniques together with the relevant terminology and definitions. Specifications of SC wire products take into account the function of the different components of SC wires to meet operational needs, maintain operational (superconducting) conditions, and accommodate mechanical forces and strains. The various forms of SC wire products distributed by manufacturers incorporate these aspects to varying degrees, depending on the superconducting materials used and the intended operating conditions/environment. Design and engineering of devices that use SC wire products take into account the unique properties of SC wires during operation. The general features of practical SC wires are described in IEC TR 61788-20 in terms of simple general characteristics to assist in the specification and use of superconducting wire products. Testing, certification, and quality control apply the relevant standard test methods to SC wires, which are specified in this part of IEC 61788.

SUPERCONDUCTIVITY –

Part 21: Superconducting wires – Test methods for practical superconducting wires – General characteristics and guidance

1 Scope

This part of IEC 61788 specifies the test methods used for validating the mechanical, electrical, and superconducting properties of practical SC wires. A wire is considered as being practical if it can be procured in sufficiently continuous lengths under ordinary commercial transactions to build devices. Conductors made of multiple wires, such as cables, are not included in the scope of this part of IEC 61788. Extension of the discussions in this part of IEC 61788 beyond practical SC wires is not intended, even though referenced documents include aspects outside of this scope.

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 from: http://www.electropedia.org

IEC 61788-1, *Superconductivity – Part 1: Critical current measurement – DC critical current of Nb-Ti composite superconductors*

IEC 61788-2, *Superconductivity – Part 2: Critical current measurement – DC critical current of Nb_3Sn composite superconductors*

IEC 61788-3, *Superconductivity – Part 3: Critical current measurement – DC critical current of Ag- and/or Ag alloy-sheathed Bi-2212 and Bi-2223 oxide superconductors*

IEC 61788-4, *Superconductivity – Part 4: Residual resistance ratio measurement – Residual resistance ratio of Nb-Ti composite superconductors*

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

IEC 61788-6, *Superconductivity – Part 6: Mechanical properties measurement – Room temperature tensile test of Cu/Nb-Ti composite superconductors*

IEC 61788-8, *Superconductivity – Part 8: AC loss measurements – Total AC loss measurement of round superconducting wires exposed to a transverse alternating magnetic field at liquid helium temperature by a pickup coil method*

IEC 61788-10, *Superconductivity – Part 10: Critical temperature measurement – Critical temperature of composite superconductors by a resistance method*

IEC 61788-11, *Superconductivity – Part 11: Residual resistance ratio measurement – Residual resistance ratio of Nb_3Sn composite superconductors*

IEC 61788-12, *Superconductivity – Part 12: Matrix to superconductor volume ratio measurement – Copper to non-copper volume ratio of Nb_3Sn composite superconducting wires*

IEC 61788-13, *Superconductivity – Part 13: AC loss measurements – Magnetometer methods for hysteresis loss in superconducting multifilamentary composites*

IEC 61788-18, *Superconductivity – Part 18: Mechanical properties measurement – Room temperature tensile test of Ag- and/or Ag alloy-sheathed Bi-2223 and Bi-2212 composite superconductors*

IEC 61788-19, *Superconductivity – Part 19: Mechanical properties measurement – Room temperature tensile test of reacted Nb_3Sn composite superconductors*