



SLOVENSKI STANDARD
SIST EN 61788-19:2014

01-april-2014

Superprevodnost - 19. del: Merjenje mehanskih lastnosti - Natezni preskus reaktivnih Nb₃Sn kompozitnih superprevodnikov pri sobni temperaturi (IEC 61788-19:2013)

Superconductivity - Part 19: Mechanical properties measurement - Room temperature tensile test of reacted Nb₃Sn composite superconductors

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Supraconductivité - Partie 19: Mesure des propriétés mécaniques - Essai de traction à température ambiante des supraconducteurs composites de Nb₃Sn mis en réaction

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ICS:

29.050 Superprevodnost in prevodni materiali Superconductivity and conducting materials

SIST EN 61788-19:2014

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 61788-19

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English version

**Superconductivity -
Part 19: Mechanical properties measurement -
Room temperature tensile test of reacted Nb₃Sn composite
superconductors
(IEC 61788-19:2013)**

Supraconductivité -
Partie 19: Mesure des propriétés
mécaniques -
Essai de traction à température ambiante
des supraconducteurs composites de
Nb₃Sn mis en réaction
(CEI 61788-19:2013)

Supraleitfähigkeit -
Teil 19: Messung der mechanischen
Eigenschaften - Zugversuch von
reagierten Nb₃Sn-Verbundsupraleitern bei
Raumtemperatur
(IEC 61788-19:2013)

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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 90/328/FDIS, future edition 1 of IEC 61788-19, prepared by IEC/TC 90 "Superconductivity" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61788-19:2014.

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) 2014-09-24
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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	-	-
ISO 376	-	Metallic materials - Calibration of force-proving instruments used for the verification of uniaxial testing machines	EN ISO 376	-
ISO 6892-1	-	Metallic materials - Tensile testing - Part 1: Method of test at room temperature	EN ISO 6892-1	-
ISO 7500-1	-	Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system	EN ISO 7500-1	-
ISO 9513	-	Metallic materials - Calibration of extensometer systems used in uniaxial testing	EN ISO 9513	-

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Superconductivity – **STANDARD PREVIEW**
Part 19: Mechanical properties measurement – Room temperature tensile test of
reacted Nb₃Sn composite superconductors

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Supraconductivité –
Partie 19: Mesure des propriétés mécaniques – Essai de traction à température
ambiante des supraconducteurs composites de Nb₃Sn mis en réaction

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
4 Principles	10
5 Apparatus.....	10
5.1 General.....	10
5.2 Testing machine.....	10
5.3 Extensometer.....	10
6 Specimen preparation.....	10
6.1 General.....	10
6.2 Length of specimen.....	10
6.3 Removing insulation.....	11
6.4 Determination of cross-sectional area (S_0).....	11
7 Testing conditions	11
7.1 Specimen gripping	11
7.2 Setting of extensometer	11
7.3 Testing speed	11
7.4 Test	11
8 Calculation of results	12
8.1 Modulus of elasticity (E).....	12
8.2 0,2 % proof strength ($R_{p0,2-F}$ and $R_{p0,2-U}$).....	13
9 Uncertainty of measurand.....	13
10 Test report.....	13
10.1 Specimen.....	13
10.2 Results	14
10.3 Test conditions	14
Annex A (informative) Additional information relating to Clauses 1 to 10.....	16
A.1 Scope	16
A.2 Extensometer.....	16
A.2.1 Double extensometer.....	16
A.2.2 Single extensometer	17
A.3 Optical extensometers	18
A.4 Requirements of high resolution extensometers	19
A.5 Tensile stress $R_{elasticmax}$ and strain $A_{elasticmax}$	20
A.6 Functional fitting of stress-strain curve obtained by single extensometer and 0,2 % proof strength ($R_{p0,2-F}$).....	21
A.7 Removing insulation.....	22
A.8 Cross-sectional area determination	22
A.9 Fixing of the reacted Nb_3Sn wire to the machine by two gripping techniques	22
A.10 Tensile strength (R_m)	23
A.11 Percentage elongation after fracture (A)	24
A.12 Relative standard uncertainty.....	24
A.13 Determination of modulus of elasticity E_0	26

A.14	Assessment on the reliability of the test equipment	27
A.15	Reference documents	27
Annex B (informative)	Uncertainty considerations	28
B.1	Overview.....	28
B.2	Definitions.....	28
B.3	Consideration of the uncertainty concept	28
B.4	Uncertainty evaluation example for TC 90 standards.....	30
B.5	Reference documents of Annex B	31
Annex C (informative)	Specific examples related to mechanical tests	33
C.1	Overview.....	33
C.2	Uncertainty of the modulus of elasticity	33
C.3	Evaluation of sensitivity coefficients	34
C.4	Combined standard uncertainties of each variable	35
C.5	Uncertainty of 0,2 % proof strength $R_{p0,2}$	38
Bibliography	43
Figure 1	– Stress-strain curve and definition of modulus of elasticity and 0,2 % proof strengths for Cu/Nb ₃ Sn wire	15
Figure A.1	– Light weight ultra small twin type extensometer	16
Figure A.2	– Low mass averaging double extensometer.....	17
Figure A.3	– An example of the extensometer provided with balance weight and vertical specimen axis.....	18
Figure A.4	– Double beam laser extensometer.....	19
Figure A.5	– Load versus displacement record of a reacted Nb ₃ Sn wire	20
Figure A.6	– Stress-strain curve of a reacted Nb ₃ Sn wire	21
Figure A.7	– Two alternatives for the gripping technique.....	23
Figure A.8	– Details of the two alternatives of the wire fixing to the machine.....	23
Figure C.1	– Measured stress-strain curve.....	33
Figure C.2	– Stress-strain curve	39
Table A.1	– Standard uncertainty value results achieved on different Nb ₃ Sn wires during the international round robin tests	25
Table A.2	– Results of ANOVA (F-test) for the variations of E_0	26
Table B.1	– Output signals from two nominally identical extensometers	29
Table B.2	– Mean values of two output signals	29
Table B.3	– Experimental standard deviations of two output signals.....	29
Table B.4	– Standard uncertainties of two output signals	30
Table B.5	– Coefficient of Variations of two output signals	30
Table C.1	– Load cell specifications according to manufacturer’s data sheet.....	35
Table C.2	– Uncertainties of displacement measurement	36
Table C.3	– Uncertainties of wire diameter measurement.....	37
Table C.4	– Uncertainties of gauge length measurement	37
Table C.5	– Calculation of stress at 0 % and at 0,1 % strain using the zero offset regression line as determined in Figure C.1 (b).....	38
Table C.6	– Linear regression equations computed for the three shifted lines and for the stress – strain curve in the region where the lines intersect	40

Table C.7 – Calculation of strain and stress at the intersections of the three shifted lines with the stress – strain curve	40
Table C.8 – Measured stress versus strain data and the computed stress based on a linear fit to the data in the region of interest	41

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SUPERCONDUCTIVITY –

**Part 19: Mechanical properties measurement –
Room temperature tensile test of reacted Nb₃Sn
composite superconductors**

FOREWORD

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International Standard IEC 61788-19 has been prepared by IEC technical committee 90: Superconductivity.

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

FDIS	Report on voting
90/328/FDIS	90/330/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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
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INTRODUCTION

The Cu/Nb₃Sn superconductive composite wires are multifilamentary composite materials. They are manufactured in different ways. The first method is the bronze route, where fine Nb / Nb alloy filaments are embedded in a bronze matrix, a barrier and a copper stabilizer. The second is the internal-tin method, where fine multifilaments are composed with copper matrix including Sn reservoirs, a barrier, and a copper stabilizer. The third is the powder-in-tube method, where Nb / Nb alloy tubes are filled with Sn rich powders and are embedded in a Cu stabilizing matrix.

Common to all types of Nb₃Sn composite wires is that the superconducting A15 phase Nb₃Sn has been formed at final wire dimension by applying one or more heat treatments for several days with a temperature at the last heat treatment step of around 640 °C or above. This superconducting phase is very brittle and failure of filaments occurs – accompanied by the degradation of the superconducting properties.

Commercial composite superconductors have a high current density and a small cross-sectional area. The major application of the composite superconductors is to build superconducting magnets. This can be done either by winding the superconductor on a spool and applying the heat treatment together with the spool afterwards (wind and react) or by heat treatment of the conductor before winding the magnet (react and wind). While the magnet is being manufactured, complicated stresses are applied to its windings. Therefore the react and wind method is the minority compared to the wind and react manufacturing process.

In the case that the mechanical properties should be determined in the unreacted, non-superconducting stage of the composite, one should also apply this standard or alternatively IEC 61788-6 (*Superconductivity – Part 6: Mechanical properties measurement – Room temperature tensile test of Cu/Nb-Ti composite superconductors*).

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While the magnet is being energized, a large electromagnetic force is applied to the superconducting wires because of their high current density. In the case of the react and wind manufacturing technique, the winding strain and stress levels are very restricted.

It is therefore a prerequisite to determine the mechanical properties of the superconductive reacted Nb₃Sn composite wires of which the windings are manufactured.