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Interested committees:

Title: BS EN IEC 61788-28 Mechanical properties measurement - Tensile test of practical REBCO and BSCCO composite superconductors at cryogenic temperatures

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



90/512/CD

COMMITTEE DRAFT (CD)

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IEC TC 90 : SUPERCONDUCTIVITY	
SECRETARIAT: Japan	SECRETARY: Mr Jun Fujikami
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY	

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Mechanical properties measurement - Tensile test of practical REBCO and BSCCO composite superconductors at cryogenic temperatures

NOTE FROM TC/SC OFFICERS:

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FOREWORD

INTRODUCTION

Several types of composite superconductors have now been commercialized. The rare-earth-based oxide superconductor (SC) with chemical formula $RE_1Ba_2Cu_3O_7$ is used as practical SC wires, where the rare-earth element RE is Y, Dy, Gd, Nd, Ho and Sm or a mixture of them. This type of practical SC wires is usually called REBCO coated conductors. A typical architecture consists of a substrate of Hastelloy, Ni-W alloy or stainless steel, a buffer layer consisting of plural of oxides, a SC layer and a protection layer of Ag. The substrate and buffer layer acts as template to facilitate the well-oriented SC layer. In order to resist the large electromagnet force, the wires are often externally reinforced by laminating thin stainless steel or copper or copper alloy foils or by electroplating copper.

Two types of bismuth-based oxide superconductors with chemical formula $(Bi, Pb)_2Sr_2Ca_{n-1}Cu_nO_{2n+4}$ where $n = 2$ or 3 , have been developed as practical SC wires. In either case, superconducting filaments are embedded into pure silver matrix. In the Bi-2223 wires, a silver alloy outer sheath surrounds the matrix for increasing mechanical strength. Bi-2223 wires are exclusively made in flat tape-shaped form. Wires are commercially available in which thin metallic sheets of copper alloy or stainless steel are soldered on both sides of the SC tapes to improve the strain dependence of critical current and the mechanical properties.

Practical composite superconductors have a high current density and a small cross-sectional area. The major application of composite superconductors is to build electrical power devices and superconducting magnets. While the magnet is manufactured, complicated stresses/strains are applied to its windings and, while it is energized, a large electromagnetic force is applied to the superconducting wires because of its high current density. It is therefore indispensable to determine the mechanical properties of the practical SC tapes at cryogenic temperatures.

SUPERCONDUCTIVITY –

Part 28: Mechanical properties measurement – Tensile test of practical REBCO and BSCCO composite superconductors at cryogenic temperatures

1 Scope

This part of IEC 61788 covers a test method detailing the tensile test procedures to be carried out on practical REBCO and BSCCO superconductive composite tapes at cryogenic temperatures. This test is used to measure the modulus of elasticity and 0,2 % proof strength. The values for elastic limit, fracture strength and percentage elongation after fracture shall serve only as a reference. The sample covered by this test procedure for REBCO wires should have a rectangular cross-section with an area of 0,3 mm² to 4,0 mm² (corresponding to the tapes with width of 2,0 mm to 12,5 mm and thickness of 0,15 mm to 0,4 mm). The sample covered by this test procedure for BSCCO wires should have rectangular cross-section with an area of 0,3 mm² to 2,0 mm² (corresponding to the tape-shaped wires with width of 2,0 mm to 5,0 mm and thickness of 0,16 mm to 0,4 mm).

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of IEC 61788. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61788 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050-815:2000, *International Electrotechnical Vocabulary (IEV) – Part 815: Super- conductivity*

IEC 61788-21 CD: *Superconductivity - Part 21: Superconducting wires – Test Methods for Practical Superconducting Wires, General Characteristics and Guidance*

IEC 61788-6, Ed.3: *Superconductivity – Part 6: Mechanical properties measurement – Room temperature tensile test of Cu/Nb-Ti composite superconductors*

IEC 61788-18, CD: *Superconductivity – Part 18: Mechanical properties measurement – Room temperature tensile test of BSCCO composite superconductors*

IEC 61788-19, CD: *Superconductivity – Part 19: Mechanical properties measurement – Room temperature tensile test of Nb₃Sn composite superconductors*

IEC 61788-25, CD: *Superconductivity – Part 25: Mechanical properties measurement – Room temperature tensile test of REBCO composite superconductors*

ISO 376:1999, *Metallic materials – Calibration of force-proving instruments used for the verification of uniaxial testing machines*

ISO 6892:1998, *Metallic materials – Tensile testing at ambient temperature*

ISO 7500-1:1999, *Metallic materials – Verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system*

ISO 9513:1999, *Metallic materials – Calibration of extensometers used in uniaxial testing* ASTM E 83-85, *Standard Practice for Verification and Classification of Extensometers*