IEC 61788-24

Edition 1.0 2018-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Superconductivity –
Part 24: Critical current measurement – Retained critical current after double bending at room temperature of Ag-sheathed Bi-2223 superconducting wires

Supraconductivité –
Partie 24: Mesurage du courant critique – Courant critique retenu après double flexion à température ambiante des fils supraconducteurs Bi-2223 avec gaine Ag

IEC 61788-24:2018-06(en-fr)

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FOREWORD

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

FDIS	Report on voting
90/402/FDIS	90/406/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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INTRODUCTION

In 1988, a new class of high critical temperature (T_c) copper oxide superconductors, Bi-Sr-Ca-Cu-O, was discovered. After nearly three decades, $(Bi,Pb)_2Sr_2Ca_2Cu_3O_x$ (Bi-2223) is now being utilized as a commercial high-T_c superconducting wire.

Superconducting wires are often subjected to bending deformation during production and application, e.g. during wire processing, magnet construction, cable fabrication, etc. The wire is bent towards both the upper and lower directions as it passes through several pulleys. These production processes are carried out at room temperature. Critical current of the wire is likely influenced through such bending, and may be accompanied by irreversible degradation in case of large deformation. The easiest way to evaluate the influence of bending on critical current is to carry out comparative measurement with the wire in the straight form before and after bending to a specific diameter.

After a wire is made into a coil or a cable, critical current is often measured under bending conditions or a more complex deformation state. In these cases, change in critical current may include both reversible and irreversible contributions depending on the amount of deformation. Irreversible degradation usually originates from a fracture in the superconducting component. In order to evaluate only irreversible contributions, measuring the retained critical current after the wire is straightened back from its deformed shape is necessary.

The critical bending diameter below which wire performance degrades significantly is typically specified for use of commercial superconducting wire. Thus, it is important to standardize measurement methods for the retained critical current after double bending. This document can be applied to other similar bending tests such as single bending, cyclic bending, etc.

This document consists of two fundamental technologies of the critical current measurement and the double bending process.

SUPERCONDUCTIVITY –

Part 24: Critical current measurement – Retained critical current after double bending at room temperature of Ag-sheathed Bi-2223 superconducting wires

1 Scope

This part of IEC 61788 describes a test method for determining the retained critical current after double bending at room temperature of short and straight Ag- and/or Ag alloy-sheathed Bi-2223 superconducting wires that have the shape of a flat or square tape containing mono- or multicores of oxides. The wires can be laminated with copper alloy, stainless steel or Ni alloy tapes.

The test method is intended for use with superconductors that have a critical current less than 300 A and an n-value larger than 5. The test to determine the retained critical current is carried out without an applied magnetic field, with the test specimen immersed in a liquid nitrogen open bath.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-815:2015, *International Electrotechnical Vocabulary – Part 815: Superconductivity* (available at http://www.electropedia.org/)

3 Terms and definitions

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- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
double bending
bending in one direction to a certain diameter followed by the subsequent bending in the opposite direction to the same diameter

Note 1 to entry: Bending diameter is defined as the diameter of the bending mandrel.

Note 2 to entry: The definition of bending diameter is in principle the sum of the mandrel diameter and superconductor thickness. In the engineering process, however, the minimum diameter of the pulleys through which the wire is passed should also be considered.