ICS 25.160.01 SLOVENSKÁ TECHNICKÁ NORMA Apríl 2019

STN	**Zváranie Mikrospájanie druhej generácie vysokoteplotných supravodičov Časť 2: Kvalifikácia pre zváranie a skúšanie personálu (ISO 17279-2: 2018)**	**STN EN ISO 17279-2** 05 0350

Welding - Micro joining of 2nd generation high temperature superconductors - Part 2: Qualification for welding and testing personnel (ISO 17279-2:2018)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 03/19

Obsahuje: EN ISO 17279-2:2018, ISO 17279-2:2018

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 17279-2

November 2018

ICS 25.160.01

English Version

Welding - Micro joining of 2nd generation high temperature superconductors - Part 2: Qualification for welding and testing personnel (ISO 17279-2:2018)

Soudage - Micro-assemblage des supraconducteurs à haute température de deuxième génération - Partie 2: Qualification du personnel en soudage et d'essai (ISO 17279-2:2018)

Schweißen - Mikrofügen von Hochtemperatursupraleitern der zweiten Generation - Teil 2: Qualifizierung für Schweiß- und Prüfpersonal (ISO 17279-2:2018)

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EN ISO 17279-2:2018 (E)

Contents

Page

European foreword

This document (EN ISO 17279-2:2018) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 “Welding and allied processes” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2019, and conflicting national standards shall be withdrawn at the latest by May 2019.

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Endorsement notice

The text of ISO 17279-2:2018 has been approved by CEN as EN ISO 17279-2:2018 without any modification.

INTERNATIONAL STANDARD

ISO 17279-2

First edition
2018-10

Welding — Micro joining of 2nd generation high temperature superconductors —

Part 2: Qualification for welding and testing personnel

Soudage — Micro-assemblage des supraconducteurs à haute température de deuxième génération —

Partie 2: Qualification du personnel en soudage et d'essai

Reference number
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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Quality management in the field of welding*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

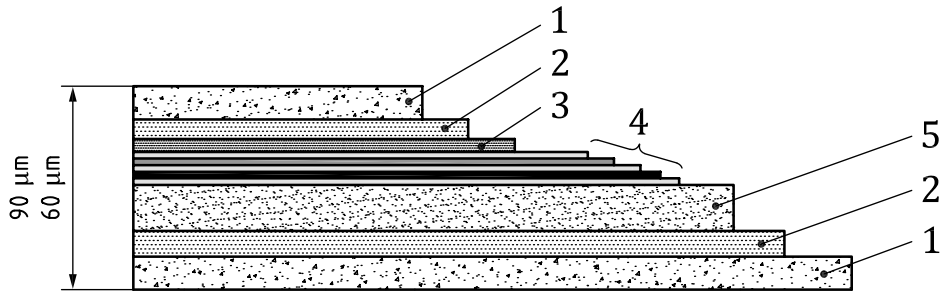
A list of all parts in the ISO 17279 series can be found on the ISO website.

Introduction

The increasing use of 2nd generation high temperature superconductors (2G HTSs) and invention of resistance-free joining on 2G HTSs have created the need for this document in order to ensure that joining is carried out in the most effective way and that appropriate control is exercized over all aspects of the operation. ISO standards for micro-joining and joint evaluation procedure are accordingly essential to get the best and uniform quality of 2G HTS joint.

A superconductor is a material that conducts electricity without resistance and has diamagnetism below critical temperature, T_c, critical magnetic field, B_c, and critical current density, J_c. Once set in motion, electrical current flows forever in a closed loop of superconducting material under diamagnetism.

A 2G HTS consists of multi-layers and its total thickness is around between 60 µm and 100 µm with or without surrounding copper stabilizer. The superconducting layer made from $ReBa_2Cu_3O_{7-x}$ (ReBCO, abbreviated term of $ReBa_2Cu_3O_{7-x}$) is only between 1 µm and 2 µm thick depending on manufacturer's specifications. Re stands for Rare Earth materials, of which gadolinium, yttrium and samarium are used for 2nd generation high temperature superconducting materials. Figure 1 shows schematic drawing of typical multiple layers with surrounded copper stabilizer, and the constituents and thicknesses of each layer in the 2G HTS. The two layers of No. 1 in Figure 1 does not exist in stabilizer-free 2G HTS.



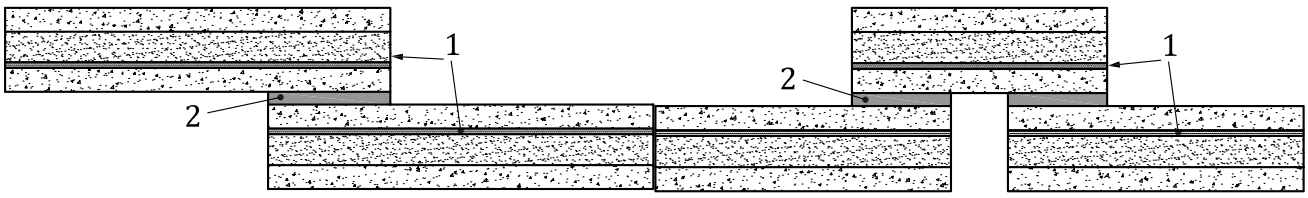
Key

1 20 µm Cu stabilizer
2 2 µm Ag overlayer
3 between 1 µm and 2 µm ReBCO super-conducting layer
4 5 buffing layers (total 160 nm)
5 50 µm hastelloy substrate

NOTE Not to scale.

Figure 1 — Typical 2G HTS multi-layers, and the constituents and thicknesses of each layer

Currently soldering, brazing or any filler is applied in superconducting industry as shown in Figure 2, which shows high electrical resistance at the joint providing fatal flaw in the superconductor.



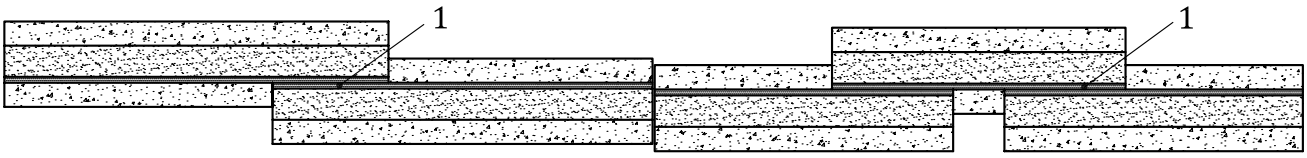
a) Lap joint **b) Bridge joint**

Key

1 superconducting layer
2 solder

Figure 2 — Soldering to join 2G HTS

However, this document focuses on the direct autogenous joining of between 1 µm and 2 µm-thick superconducting layers of 2G HTSs as shown in Figure 3 without filler metals and recovery of superconducting properties by oxygenation annealing process, which shows almost no electrical resistance at the joint.



a) Lap joint **b) Bridge joint**

Key

1 superconducting layer

Figure 3 — Direct autogenous joining of two superconducting layers of 2G HTSs for superconducting joint

INTERNATIONAL STANDARD **ISO 17279-2:2018(E)**

Welding — Micro joining of 2nd generation high temperature superconductors —

Part 2: Qualification for welding and testing personnel

1 Scope

This document specifies the qualification requirements for personnel performing micro-joining and oxygenation anneling, and testing the 2G HTS test joints.

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.

ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials — General rules*

ISO 17279-1, *Welding — Micro-joining of 2nd generation high temperature superconductors — Part 1: General requirements for the procedure*

