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Specification and qualification of welding procedures for metallic materials — Welding procedure test —

Part 6:
Arc welding of copper and its alloys

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques — Epreuve de qualification d'un mode opératoire de soudage —

Partie 6: Soudage à l'arc sur cuivre et les alliages de cuivre

ICS 25.160.10

ISO/CEN PARALLEL ENQUIRY

This draft International Standard is a draft European Standard developed within the European Committee for Standardization (CEN) and processed under the CEN-lead mode of collaboration as defined in the Vienna Agreement. The document has been transmitted by CEN to ISO for circulation for ISO member body voting in parallel with CEN enquiry. Comments received from ISO member bodies, including those from non-CEN members, will be considered by the appropriate CEN technical body. **Accordingly, ISO member bodies who are not CEN members are requested to send *a copy* of their comments on this DIS directly to CEN/TC 121** (DS, Kollegievej, 6, DK - 2920 Charlottenlund) **as well as returning their vote and comments in the normal way to the ISO Central Secretariat.** Should this DIS be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15614-6 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

ISO 15614 consists of the following parts, under the general title *Specification and qualification of welding procedures for metallic materials — Welding procedure test*:

- *Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*
- *Part 2: Arc welding of aluminium and its alloys*

- *Part 4: Finishing welding of aluminium castings*
- *Part 5: Arc welding of titanium, zirconium and their alloys*
- *Part 6: Arc welding of copper and its alloys*
- *Part 8: Welding of tubes to tube-plate joints*
- *Part 9: Arc underwater hyperbaric wet welding*
- *Part 10: Underwater hyperbaric dry welding*
- *Part 11: Electron and laser beam welding*
- *Part 12: Spot, seam and projection welding*
- *Part 13: Resistance butt and flash welding*

EUROPEAN STANDARD

NORME EUROPÉENNE

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English version

Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 6: Arc welding of copper and its alloys (ISO/DIS 15614-6:2003)

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Epreuve de qualification d'un mode opératoire de soudage - Partie 6: Soudage à l'arc sur cuivre et les alliages de cuivre (ISO/DIS 15614-6:2003)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 121.

If this draft becomes a European Standard, CEN 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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN ISO 15614-6:2003) has been prepared by Technical Committee CEN/TC 121 “Welding and allied processes”, the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 “Welding”.

This document is currently submitted to the parallel Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives 97/23/EEC and 87/404/EEC.

For relationship with EU Directives, see informative Annex ZA, which is an integral part of this document.

Introduction

All new welding procedure tests are to be in accordance with this standard from the date of its issue.

However, this standard does not invalidate previous welding procedure tests made to former national standards or specifications.

Were additional tests have to be carried out to make the qualification technically equivalent, it is only necessary to do the additional tests on a test piece which should be made in accordance with this standard.

1 Scope

This standard is part of a series of standards. Details of this series are given in EN ISO 15607, Annex A.

This standard specifies how a welding procedure specification is qualified by welding procedure tests.

This standard defines the conditions for the execution of welding procedure tests and the range of qualification for welding procedures for all practical welding operations within the range of variables listed in clause 8.

Tests shall be carried out in accordance with this standard. Additional tests may be required by application standards.

This standard applies to the arc welding of copper and copper alloys in all product forms.

Arc and gas welding are covered by the following processes in accordance with EN ISO 4063:

111 manual metal arc welding;

131 metal inert gas welding, MIG welding;

141 tungsten inert gas welding, TIG welding;

15 plasma arc welding;

311 gas welding.

The principles of this standard may be applied to other fusion welding processes.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 439, *Welding consumables – Shielding gases for arc welding and cutting.*

EN 473, *Non-destructive testing – Qualification and certification of NDT personnel – General principles.*

EN 571-1, *Non destructive testing – Penetrant testing – Part1: General principles.*

EN 729 - relevant part, *Quality requirements for fusion welding of metallic materials.*

EN 895, *Destructive tests on welds in metallic materials – Transverse tensile test.*

EN 910, *Destructive tests on welds in metallic materials – Bend tests.*

EN 970, *Non-destructive examination of fusion welds – Visual examination.*

EN 1320, *Destructive tests on welds in metallic materials – Fracture test.*

EN 1321, *Destructive tests on welds – Microscopic and macroscopic examination of welds.*

EN 1418, *Welding personnel – Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanised and automatic welding of metallic materials.*

EN 1435, *Non-destructive examination of welds – Radiographic examination of welded joints.*

EN ISO 4063, *Welding and allied processes – Nomenclature of processes and reference numbers,*

EN-ISO 6520-1*, Welding and allied processes – Classification of geometric imperfections in metallic materials.*

EN ISO 6947:1997*, Welds – Working positions – Definitions of angles of slope and rotation. (ISO 6947:1993)*

EN ISO 9606-3, *Approval testing of welders – Fusion welding – Part 3: Copper and copper alloys. (ISO 9606-3:1999)*

EN 12062, *Non-destructive examination of welds – General rules for metallic material.*

EN 12345*, Welding – Multilingual terms for welded joints with illustrations.*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials – General rules..*

CR ISO/TR 15608:2000, *Welding – Guidelines for a metallic material grouping system. (ISO/TR 15608:2000)*[*)]

prEN ISO 15609-1, *Specification and qualification of welding procedure for metallic materials – Welding procedure specification – Part 1: Arc welding (ISO/DIS 15609-1:2000)*

EN ISO 15609-2, *Specification and qualification of welding procedure for metallic materials – Welding procedure specification – Part 2: Gas welding*

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials – Approval by a pre-production test.*

EN 30042, *Arc-welded joints in aluminium and its weldable alloys – Guidance on quality levels for imperfections. (ISO 10042:1992)*

3 Terms and definitions

For the purpose of this European standard, the terms and definitions given in prEN ISO 15607 shall apply.

*) See foreword

4 Preliminary welding procedure specification (pWPS)

The preliminary welding procedure specification shall be prepared in accordance with prEN ISO 15609-1 or EN ISO 15609–2.

5 Welding procedure test

The making and testing of test pieces shall be in accordance with clauses 6 and 7 of this standard.

The welder or welding operator who undertakes the welding procedure test satisfactorily in accordance with this standard is qualified for the appropriate range of qualification given in EN ISO 9606-3 or EN 1418 providing that the relevant testing requirements are met.

6 Test piece

6.1 General

The welded joint to which the welding procedure will relate in production shall be represented by making a standardized test piece or pieces, as specified in 6.2. Where the production/joint geometry requirements do not represent the standardized test pieces as shown in this standard, the use of EN ISO 15613 shall be required.

6.2 Shape and dimensions of test pieces

The length or number of test pieces shall be sufficient to allow all required tests to be carried out.

Additional test pieces, or longer test pieces than the minimum size, may be prepared in order to allow for extra and/or for re-testing specimens (see 7.6).

For all test pieces except branch connections (Figure 5) and fillet welds (Figure 4) the material thickness, *t*, shall be the same for both plates/pipes to be welded.

If required by the application standard, the direction of plate rolling shall be marked on the test piece.

The thickness and/or pipe outside diameter of the test pieces shall be selected in accordance with 8.3.2.1 to 8.3.2.4.

The shape and minimum dimensions of the test piece shall be as follows :

6.2.1 Butt joint in plate with full penetration

The test piece shall be prepared in accordance with figure 1.

6.2.2 Butt weld between plates with raised edges

The test piece shall be prepared in accordance with figure 2.

6.2.3 Butt joint in pipe with full penetration

The test piece shall be prepared in accordance with figure 3.

NOTE The word « pipe », alone or in combination, is used to mean « pipe », « tube » or « hollow section ».

6.2.4 T-joint

The test piece shall be prepared in accordance with figure 4.

This may be used for fully penetrated butt welds or fillet welds.

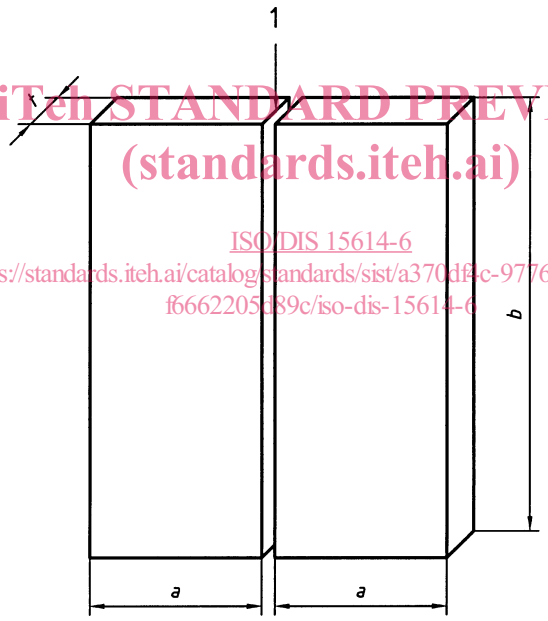
6.2.5 Branch connection

The test piece shall be in accordance with figure 5. The angle α is the minimum to be used in production. This may be used for fully penetrated joints (set-on or set-in or set-through joint and for fillet welds).

6.3 Welding of test pieces

Preparation and welding of test pieces shall be carried out in accordance with the pWPS, and under the general conditions of welding in production which they shall represent. Welding positions and limitations for the angle of slope and rotation of the test piece shall be in accordance with EN ISO 6947. If tack welds are to be fused into the final joint they shall be included in the test piece.

Welding and testing of the test pieces shall be witnessed by an examiner or examining body.



Key
1 Joint preparation and fit-up as detailed in the preliminary Welding Procedure Specification (pWPS)
a Minimum value 125 mm.
b Minimum value 300 mm.
t Material thickness

Figure 1 – Test piece for a butt joint in plate with full penetration