INTERNATIONAL STANDARD

ISO 15614-1

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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

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

Partie 1: Soudage à l'arc et aux gaz des aciers et soudage à l'arc des nickels et alliages de nickel

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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.

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 15614-1 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces ISO 9956-3:1995 of which it constitutes a technical revision.

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

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 3: Arc welding of cast irons*

— *Part 4: Arc welding of aluminium castings*

— *Part 5: Arc welding of titanium, zirconium and their alloys*

— *Part 6: Arc welding of copper and copper alloys*

— *Part 7: Corrosion resistant overlay, cladding restore and hardfacing*

— *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*

Annex ZA provides a list of corresponding International and European Standards for which equivalents are not given in the text.

For the purposes of this part of ISO 15614, the CEN annex regarding fulfilment of European Council Directives has been removed.

Contents

Foreword

This document (EN ISO 15614-1:2004) has been prepared by Technical Committee CEN/TC 121 "Welding", the secratariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

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 December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

This document replaces EN 288-3:1992.

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 Directive(s).

Annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

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

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

Where 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 European Standard is part of a series of standards, details of this series are given in EN ISO 15607:2003, annex A.

This standard specifies how a preliminary 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 and gas welding of steels in all product forms and the arc welding of nickel and nickel 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 (metal-arc welding with covered electrode);

114 - self-shielded tubular-cored arc welding;

12 - submerged arc welding;

131 - metal inert gas welding, MIG welding;

135 - metal active gas welding, MAG welding;

136 - tubular-cored metal arc welding with active gas shield;

137 - tubular-cored metal arc welding with inert gas shield;

141 - tungsten inert gas arc welding; TIG welding;

15 - plasma arc welding;

311 - oxy-acetylene welding.

The principles of this European 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, including amendments (including amendments).

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

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

EN 875, *Destructive tests on welds in metallic materials - Impact tests - Test specimen location, notch orientation and examination.*

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 1011-1 *Welding –Recommendations for welding of metallic materials –Part 1: General guidance for arc welding*

EN 1043-1:1995, *Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints.*

EN 1290, *Non-destructive examination of welds - Magnetic particle examination of welds.*

EN 1321, *Destructive tests on welds in metallic materials – Macroscopic and microscopic examination of welds.*

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

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

EN 1714, *Non destructive examination of welds – Ultrasonic examination of welded joints.*

EN ISO 4063, *Welding and allied processes – Nomenclature of processes and reference numbers (ISO 4063:1998).*

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

prEN ISO 9606-1, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO/DIS 9606-1:2000).*

EN ISO 9606-4, *Approval testing of welders – Fusion welding – Part 4: Nickel and nickel alloys. (ISO 9606-4:1999).*

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

EN ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607:2003).*

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

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

EN ISO 15609-2, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 2: Gas welding (ISO 15609-2:2001).*

EN ISO 15613, *Specification and qualification of welding procedure for metallic materials – Qualification based on pre-production welding test (ISO 15613:2003).*

EN 25817, *Arc-welded joints in steel - Guidance on quality levels for imperfections (ISO 5817:1992).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 15607:2003 apply.

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 welding and testing of test pieces shall be in accordance with clauses 6 and 7.

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 according to prEN ISO 9606-1 or EN ISO 9606-4 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 (see Figure 4) and fillet welds (see Figure 3) 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 when impact tests are required to be taken in the Heat Affected Zone (HAZ).

The thickness and/or pipe outside diameter of the test pieces shall be selected in accordance with 8.3.2.1 to 8.3.2.3.

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 joint in pipe with full penetration

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

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