INTERNATIONAL STANDARD



First edition 2005-03-15

Destructive tests on welds in metallic materials — Hot cracking tests for weldments — Arc welding processes —

Part 2: Self-restraint tests

iTeh STANDARD PREVIEW Essais destructifs des soudures sur matériaux métalliques — Essais de stissuration à chaud des assemblages soudés — Procédés de soudage

à l'arc –

Parties <u>2</u> Essais sur éprouvettes auto-bridées

https://standards.iteh.ai/catalog/standards/sist/08f06206-5728-42bb-b4f5-0067b50fcf59/iso-17641-2-2005



Reference number ISO 17641-2:2005(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 17641-2:2005</u> https://standards.iteh.ai/catalog/standards/sist/08f06206-5728-42bb-b4f5-0067b50fcf59/iso-17641-2-2005

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office Case postale 56 • CH-1211 Geneva 20 Tel. + 41 22 749 01 11 Fax + 41 22 749 09 47 E-mail copyright@iso.org Web www.iso.org Published in Switzerland

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 17641-2 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

ISO 17641-2:2005

ISO 17641 consists of the following aparts, gunder the general title. Destructive tests on welds in metallic materials — Hot cracking tests for weldments. 59 Arc welding processes:

- Part 1: General
- Part 2: Self-restraint tests
- Part 3: Externally loaded tests [Technical Report]

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

Contents

Forewordv				
1	Scope	1		
2	Normative references	1		
3	Terms and definitions	1		
4	Symbols, designations and units	1		
5	Principle	2		
6 6.1 6.1.1	Description of the tests T-joint weld cracking tests General	3		
6.1.2	Dimension of the test pieces	3		
6.1.3 6.1.4	Preparation of the test pieces			
6.1.5	Examination of the test piece			
6.1.6	Test report	6		
6.2	Weld metal tensile test General	6		
6.2.1 6.2.2	General I.I.en SIANDARD PREVIEW	6		
6.2.2 6.2.3	Test specimen Examination of the test specimenstandards.iteh.ai)	ช 7		
6.2.4	Test report			
6.3	Longitudinal bend test			
6.3.1	General	8		
6.3.2	Test weld	8		
6.3.3 6.3.4	Surface preparation1	ŏ ∩		
6.3.5	Testing			
6.3.6	Examination of the test specimen1			
6.3.7	Test report1	0		
Annex	A (informative) Test report for T-joint weld cracking test1	1		
Annex	B (informative) Test report for weld metal tensile test1	2		
Annex	C (informative) Test report for longitudinal bend test1	3		
Annex	ZA (normative) List of corresponding European and International Standards for which equivalents are not given in the text1	4		

Foreword

This document (EN ISO 17641-2:2005) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DIN, 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 September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

EN ISO 17641 consists of the following parts, under the general title *Destructive tests on welds in metallic materials – Hot cracking tests for weldments – Arc welding processes:*

-Part 1: General -Part 2: Self-restraint tests -Part 3: Externally loaded tests¹

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.

(standards.iteh.ai)

<u>ISO 17641-2:2005</u> https://standards.iteh.ai/catalog/standards/sist/08f06206-5728-42bb-b4f5-0067b50fcf59/iso-17641-2-2005

¹ Part 3 will be published as a Technical Report with the same general title.

iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 17641-2:2005</u> https://standards.iteh.ai/catalog/standards/sist/08f06206-5728-42bb-b4f5-0067b50fcf59/iso-17641-2-2005

1 Scope

This standard specifies the required specimens, the test piece dimensions and the procedures to be followed to carry out self-restraint hot cracking tests.

The following tests are described:

- T-joint weld cracking test
- Weld metal tensile test
- Longitudinal bend test

The tests are designed to provide information about the hot cracking sensitivity of weld metals. The tests are not suitable for the assessment of parent materials.

The standard applies primarily to fully austenitic stainless steels; nickel, nickel base and nickel copper weld metals. The standard can also be used for other weld metals.

This standard describes only how to carry out the tests and report the results. It does not give any acceptance criteria.

iTeh STANDARD PREVIEW

2 Normative references (standards.iteh.ai)

The following referenced documents are indispensable for the application 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 and add/sist/08106206-5728-42bb-b415-

EN 876, Destructive tests on welds in metallic materials - Longitudinal tensile test on weld metal in fusion welded joints

EN 910, Destructive tests on welds in metallic materials - Bend tests

EN 1597-1, Welding consumables - Test methods - Part 1: Test piece for all-weld metal test specimens in steel, nickel and nickel alloys

EN 10002-1, Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature

EN ISO 15614-1, 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 (ISO 15614-1:2004)

EN ISO 17641-1:2004, Destructive tests on welds in metallic materials - Hot cracking tests for weldments – Arc welding processes - Part 1: General (ISO 17641-1:2004)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 17641-1:2004 apply.

4 Symbols, designations and units

For the purposes of this European Standard, the symbols and units given in Table 1 apply.

T-joint weld cracking test roat thickness of weld bead 1 roat thickness of weld beat 2 ickness of vertical plate, form C ickness of horizontal plate, form C Weld metal tensile test weld metal tensile test recimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm mm mm mm mm mm mm		
roat thickness of weld beat 2 ickness of vertical plate, form C ickness of horizontal plate, form C Weld metal tensile test recimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm mm mm mm mm		
ickness of vertical plate, form C ickness of horizontal plate, form C Weld metal tensile test eccimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm mm mm mm		
ickness of horizontal plate, form C Weld metal tensile test ecimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm mm mm		
Weld metal tensile test becimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm mm		
ecimen diameter st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm		
st length easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm mm		
easuring length on the test specimen easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm mm mm		
easuring length on the test specimen after fracture ^a tal length tal crack length of all detected cracks > 0,1 mm	mm		
tal crack length of all detected cracks > 0,1 mm	mm		
tal crack length of all detected cracks > 0,1 mm			
-	mm		
Length of an individual crack			
Microcracks Sensitivity Indicator (Tensile test) ^b			
Longitudinal bend test (LBT)			
Radius of the test specimen edges >1 DARD PREVIEW			
idth of the test specimen (standards.iteh.ai)	mm		
idth of outside fusion line	mm		
ngth of an individual crack ISO 17641-2:2005	mm		
ngth of crack examination area before bending ngth of crack examination area before bending	mm		
tal crack length of all detected cracks >0.1	mm		
aximum width of the weld after machining	mm		
crocrack Sensitivity Indicator (Longitudinal Bend Test) ^c	mm/mm		
gure 4 / x π			
	ISO 17641-2:2005 https://standards.iieh.al/catabo/standards/sist/08106206-5728-42bb-b415- ngth of crack examination area before bending /f641-2-2005 tal crack length of all detected cracks >0.1 aximum width of the weld after machining crocrack Sensitivity Indicator (Longitudinal Bend Test) ^c gure 4		

Table 1 - Symbols, designations and units

5 Principle

Three test methods are described which are designed to measure the sensitivity of weld metals to the types of hot cracking described in clause 3. These test methods are described in Table 2.

In all cases the cracks are generated during the welding of the test pieces. The tensile test and longitudinal bend test are subjected to additional straining, which does not generate any new cracks, but widens the cracks formed during the welding, which enables them to be more easily detected and measured.

Type of Test	Types of cracking	Results	Applications
T-joint weld	Solidification	Qualitative	Qualification of welding consumables
cracking test			Qualification test for welding consumables
	Solidification		Welding procedure qualification
Weld metal	Liquation	Qualitative or quantitative if Microcrack Sensitivity Index MSI _(TT) is used	Production weld coupon test
tensile tests	Ductility dip		Qualification of consumables
			Qualification test for welding consumables
	Solidification	Qualitative or quantitative if MSI _(LBT) is used	Welding procedure qualification
	Liquation		Production weld coupon test
Longitudinal bend test			Qualification of welding consumables
			Qualification test for welding consumables

Table 2 - Self-restraint hot cracking tests and applications

6 Description of the tests STANDARD PREVIEW

T-ioint weld cracking tests (standards.iteh.ai)

nt weld cracking tests

<u>ISO 17641-2:2005</u>

6.1.1 General https://standards.iteh.ai/catalog/standards/sist/08f06206-5728-42bb-b4f5-

0067b50fcf59/iso-17641-2-2005 The test procedure applies to a single pass restrained fillet weld. It can be used with the manual shielded metal arc, gas metal arc and tungsten arc welding processes. It is not suitable for high current processes such as submerged arc.

The test method only provides a qualitative assessment (cracks or no cracks) and has a comparatively low sensitivity.

6.1.2 Dimension of the test pieces

6.1

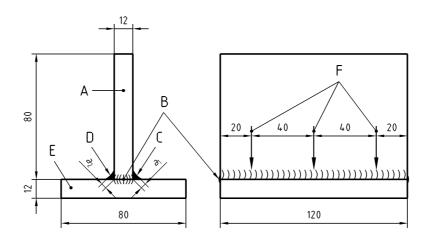
Three types of test (A, B and C) are specified. Type A is the standard test piece. Types B and C are more highly restrained and are used to simulate more severe conditions.

The dimensions of the test pieces shall be as shown in Figure 1.

The test pieces shall be made from the parent material for which the consumable is designed (consumable approval test) or that which is to be used in a fabrication (procedure qualification test).

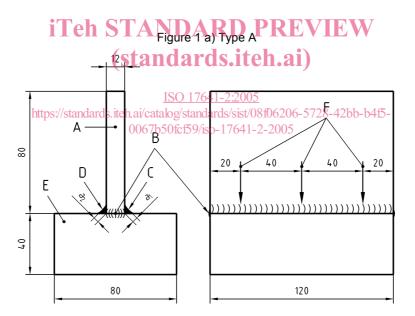
Type B requires the use of a 40 mm thick horizontal plate. If this is not available, then Type C, which uses 10 mm thick stiffeners welded on the horizontal plate, may be used. The thickness of the horizontal and vertical plate and/or the stiffeners can be modified.

Dimensions in millimetres



Key

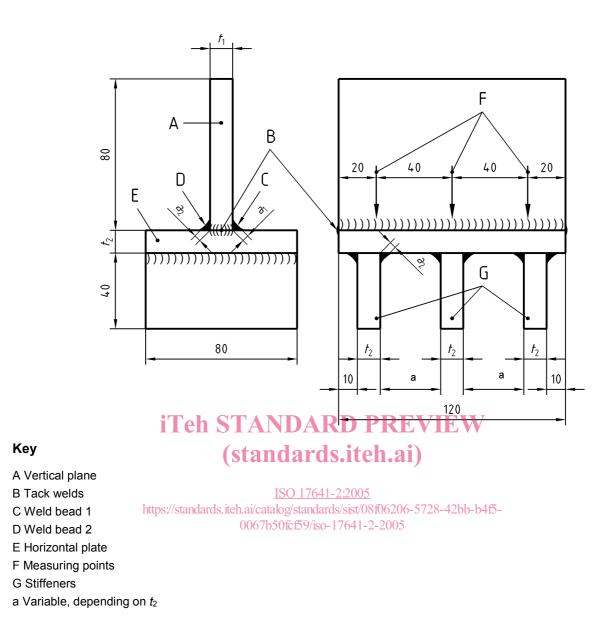
- A Vertical plate
- B Tack welds
- C Weld bead 1
- D Weld bead 2
- E Horizontal plate
- F Measuring points



Key

- a Throat thickness (6 mm)
- A Vertical plane
- B Tack welds
- C Weld bead 1
- D Weld bead 2
- E Horizontal plate
- F Measuring points

Figure 1 b) Type B



NOTE t_1 ; t_2 It is recommended to use the thickness which is available or requested.

Figure 1 c) Type C

Figure 1 — T-joint weld cracking test type A, B and C

6.1.3 Preparation of the test pieces

Any gap between the vertical and horizontal plates will increase the risk of cracking in the test welds. It is, therefore, important to obtain consistent contact between the two. Grinding or machining the contact faces prior to welding may achieve this.

The test plates in the areas to be welded shall be clean and free from any grease, cutting fluids, paint or rust, which could affect the test results.