INTERNATIONAL STANDARD

ISO 17642-1

First edition
2004-08-01

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

Part 1: General

Essais destructifs des soudures sur matériaux métalliques — Essais de fissuration à froid des assemblages soudés — Procédés de soudage à l'arc —

Partie 1: Généralités

Reference number
ISO 17642-1:2004(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.

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 17642-1 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 17642 consists of the following parts, under the general title *Destructive tests on welds in metallic materials — Cold cracking tests for weldments — Arc welding processes*:

— *Part 1: General*

— *Part 2: Self-restraint tests*

— *Part 3: Externally loaded tests*

Foreword

This document (EN ISO 17642-1:2004) 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 February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

EN ISO 17642 consists of the following parts, under the general title *Destructive tests on welds in metallic materials - Cold cracking tests for weldments - Arc welding processes*:

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

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.

1 Scope

This standard describes the fundamentals of cold crack formation and the principles of cold cracking tests. These tests can be used to determine the cold cracking sensitivity of welding consumables, parent materials, weld metal. The most common tests are described (after referred to hydrogen cracking).

In addition, an overview is given of the cold cracking test procedures, their classification, and their fields of application are within EN ISO 17642-2 and EN ISO 17642-3.

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).

EN ISO 17642-2	*Destructive tests on welds in metallic materials - Cold cracking tests for weldments – Arc welding processes - Part 2: Self-restraint tests (ISO 17642-2:2004).*
EN ISO 17642-3	*Destructive tests on welds in metallic materials - Cold cracking test for weldments - Arc welding processes - Part 3: Externally loaded tests (ISO 17642-3:2004).*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
cold cracks
local rupture (intergranular or transgranular) appearing as a result of a critical combination of micro-structure, stress and hydrogen content

NOTE 1 Cold cracks are also known as hydrogen cracks or delayed cracks.

NOTE 2 Cold cracking occurs at temperatures below the solidus temperature, sometimes days after fabrication.

3.2
cold cracking test procedures
procedures for determining the cold cracking sensitivity of parent materials, welds metal and welded joints, in respect with the welding procedure used

3.3
self restraint tests
tests where specimen loading is produced by residual stresses developed during and after welding of a restrained weldment

3.4
externally loaded tests
tests where specimen stressing is the result of the test procedure and where the specimen is loaded externally

4 Fundamentals

Cold cracks occur after complete cooling when a critical combination of microstructure, applied stress and hydrogen is exceeded:

— The microstructure is defined mainly by the chemical analysis and the cooling time between 800 °C and 500 °C (t8/5).

— The applied stress is influenced primarily by the potential stress level, i.e. the yield point of the material, the restraint and shrinkage stresses appearing in the vicinity of the weld immediately after the welding operation.

— The hydrogen content is dependent on the hydrogen input as a function of the moisture of the coating or flux and the hydrogen diffusion as a function of the preheat, interpass and holding temperature.

NOTE For steels for which the transformation point Ac1 is far below 500 °C, cooling time between 700 °C and 300 °C is more representative.

In the cold cracking test procedures, using self-restraint specimens, the stress used for testing is provided entirely by weld shrinkage. For the type of results and the main application, see Table 1.

In the cold cracking test procedure with externally loaded specimens a defined load is imposed from outside by a suitable loading device on the specimen which produces a defined stress. For the type of results and the main application, see Table 2.

Table 1 - Self-restraint cold cracking tests (see EN ISO 17642-2) and their applications

Types of Test	Applications
CTS-Test	Qualification of welding consumables, parent materials and welding procedures.
Y-groove test (Tekken test) U - groove test (Lehigh test)	Determination of : - the minimum welding energy, - the minimum preheat temperature, - the minimum holding temperature, - the maximum diffusible hydrogen content.
NOTE The procedure provides a qualitative (cracks/no cracks) or quantitative (determination of the cracks/no cracks limit) evaluation.	

Table 2 - Externally loaded cold cracking test (see EN ISO 17642-3) and its applications

Type of test	Applications
Implant test	Qualification test for consumables, base materials. Determination of : - the minimum welding energy, - the minimum preheat temperature, - the minimum interpass temperature, - the minimum holding temperature, - the maximum diffusible hydrogen content, - the critical stress.
NOTE The procedure provides a qualitative (cracks or no cracks, single test) or quantitative (crack/no crack boundary determination) assessment.	

ICS 25.160.40

Price based on 2 pages