

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

## Part 2: Self-restraint tests

The European Standard EN ISO 17642-2:2005 has the status of a British Standard

ICS 25.160.40

# National foreword

This British Standard is the official English language version of EN ISO 17642-2:2005. It is identical with ISO 17642-2:2005. It supersedes a test detailed in BS 7363:1990 which has been deleted by amendment.

The UK participation in its preparation was entrusted to Technical Committee WEE/2, Welding tests, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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**Destructive tests on welds in metallic materials - Cold cracking tests for weldments - Arc welding processes - Part 2: Self-restraint tests (ISO 17642-2:2005)**

Essais destructifs des soudures sur matériaux métalliques -  
Essais de fissuration à froid des assemblages soudés -  
Procédés de soudage à l'arc - Partie 2: Essais sur  
éprouvette auto-bridée (ISO 17642-2:2005)

Zerstörende Prüfung von Schweißverbindungen an  
metallischen Werkstoffen - Kaltrissprüfungen für  
Schweißungen - Lichtbogenschweißprozesse - Teil 2:  
Selbstbeanspruchende Prüfungen (ISO 17642-2:2005)

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This European Standard exists 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 Central Secretariat has the same status as the official versions.

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## Contents

page

|                                                                                                                        |    |
|------------------------------------------------------------------------------------------------------------------------|----|
| Foreword.....                                                                                                          | 3  |
| 1 Scope .....                                                                                                          | 4  |
| 2 Normative references .....                                                                                           | 4  |
| 3 Terms and definitions .....                                                                                          | 4  |
| 4 Designation and symbols .....                                                                                        | 5  |
| 5 Principle.....                                                                                                       | 5  |
| 5.1 General.....                                                                                                       | 5  |
| 5.2 Qualitative evaluation.....                                                                                        | 5  |
| 5.3 Quantitative evaluation .....                                                                                      | 5  |
| 6 Test.....                                                                                                            | 6  |
| 6.1 CTS-test .....                                                                                                     | 6  |
| 6.1.1 Dimensions of the test pieces .....                                                                              | 6  |
| 6.1.2 Preparation of the test pieces .....                                                                             | 6  |
| 6.1.3 Anchor welds .....                                                                                               | 7  |
| 6.1.4 Test welds.....                                                                                                  | 8  |
| 6.1.5 Test results.....                                                                                                | 10 |
| 6.2 TEKKE-test (Y-groove) and Lehigh test (U-groove) .....                                                             | 12 |
| 6.2.1 General.....                                                                                                     | 12 |
| 6.2.2 Dimensions of the test pieces .....                                                                              | 12 |
| 6.2.3 Preparation of the test pieces .....                                                                             | 14 |
| 6.2.4 Anchor welds .....                                                                                               | 14 |
| 6.2.5 Test welds.....                                                                                                  | 14 |
| 6.2.6 Test results.....                                                                                                | 16 |
| 7 Test report (CTS, Y and U groove) .....                                                                              | 19 |
| Annex A (informative) Test report for CTS test .....                                                                   | 20 |
| Annex B (informative) Test report for Y- or U-joint (TEKKEN) weld cracking test .....                                  | 21 |
| Annex ZA (normative) Normative references to International publications with their relevant European publication ..... | 22 |

## Foreword

This document (EN ISO 17642-2:2005) 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 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 specifies the sizes of the test pieces, the specimens and the procedures for carrying out self-restraint cold cracking tests by:

- CTS(Controlled Thermal Severity)-test
- Tekken (Y-groove) or Lehigh (U-groove) test

in order to obtain information about the cold cracking sensitivity during welding.

This standard applies primarily but not exclusively to C-Mn and low alloy steels.

## 2 Normative references

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.

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

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

EN ISO 3690, *Welding and allied processes - Determination of hydrogen content in ferritic arc weld metal (ISO 3690:2000)*

EN ISO 17642-1:2004, *Destructive tests on welds in metallic materials - Cold cracking tests for weldments - Arc welding processes - Part 1: General (ISO 17642-1:2004)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 17642-1:2004 apply.

## 4 Designation and symbols

The following designations and symbols given in Table 1 apply.

**Table 1 — Designation and symbols**

| Symbol                                 | Designation                               | Unit |
|----------------------------------------|-------------------------------------------|------|
| CTS-test                               |                                           |      |
| $t$                                    | material thickness                        | mm   |
| $L_V$                                  | leg length vertical                       | mm   |
| $L_H$                                  | leg length horizontal                     | mm   |
| $L$                                    | length of the test bead                   | mm   |
| Tekken or Lehigh test (Y and U-groove) |                                           |      |
| $t$                                    | material thickness                        | mm   |
| $g$                                    | root gap                                  | mm   |
| $W$                                    | diameter of drilled hole and groove width | mm   |
| $C_f$                                  | crack ratio for surface cracks            | %    |
| $C_r$                                  | crack ratio for root cracks               | %    |
| $C_s$                                  | crack ratio for cracks in sections        | %    |
| $l_f$                                  | length of surface crack                   | mm   |
| $l_r$                                  | length of root crack                      | mm   |
| $H_C$                                  | height root crack                         | mm   |
| $H$                                    | minimum thickness of test bead            | mm   |
| $L$                                    | length of the test bead                   | mm   |

## 5 Principle

### 5.1 General

The self-restraint cold cracking tests are designed to assess the cold cracking sensitivity of the parent materials and the arc welding consumables. The test consists of depositing a weld bead on a test sample made of two plates with pre-defined conditions and to examine transverse cut faces of the weld with a view to detect possible cracks either in the weld metal or in the heat affected zone.

This test procedure essentially applies to metal arc welding with covered electrodes and semi-automatic gas metal arc welding using solid and tubular wires. In general this method is not used for high current processes such as submerged-arc welding.

### 5.2 Qualitative evaluation

When using well determined welding conditions for welding a given material, a single evaluation test is performed. In the case of the CTS-test, the two test welds are examined.

### 5.3 Quantitative evaluation

When aiming at determining the cracking limit, a series of tests shall be performed. The no crack test shall be repeated, on the contrary, other tests shall be performed.

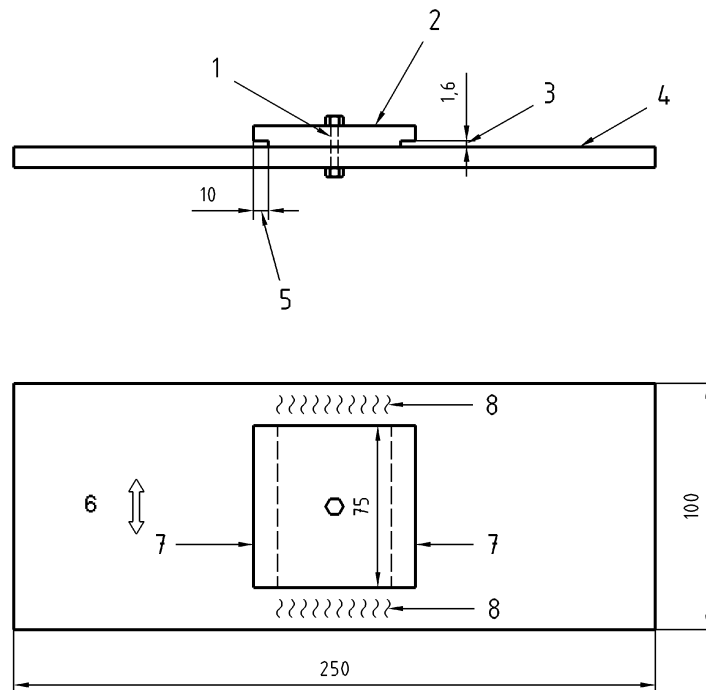
## 6 Test

### 6.1 CTS-test

#### 6.1.1 Dimensions of the test pieces

The dimensions of the test piece shall be in accordance with Figure 1.

Dimensions in millimetres



#### Key

- 1 Clearance hole 13 mm diameter
- 2 Top plate
- 3 Root notch gap
- 4 Bottom plate
- 5 Root notch depth
- 6 Preferred principal rolling direction
- 7 Test welds
- 8 Anchor welds

Figure 1 — CTS test

#### 6.1.2 Preparation of the test pieces

All test pieces shall be prepared from those parent materials which are actually to be welded with the welding consumables to be tested (see Figure 2).

Machine the test material for the pieces by sawing, milling or grinding. Ensure that surfaces to be welded are milled or ground finish. Take care to minimize heating and deformation in the material during machining.

Use the general arrangement of the test piece shown in Figure 1 and the tolerances and surface finish requirements given in Table 2.