

# SVENSK STANDARD

## SS-EN ISO 17639:2013



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### **Mekanisk provning av svetsar i metalliska material – Makroskopisk och mikroskopisk undersökning av svetsar (ISO 17639:2003)**

**Destructive tests on welds in metallic materials – Macroscopic  
and microscopic examination of welds (ISO 17639:2003)**

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Denna standard ersätter SS-EN 1321, utgåva 1.

The European Standard EN ISO 17639:2013 has the status of a Swedish Standard. This document contains the official version of EN ISO 17639:2013.

This standard supersedes the Swedish Standard SS-EN 1321, edition 1.

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Denna standard är framtagen av kommittén för Kvalifikationskrav vid svetsning, SIS/TK 134/AGS 445.

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EUROPEAN STANDARD

**EN ISO 17639**

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2013

ICS 25.160.40

Supersedes EN 1321:1996

English Version

## Destructive tests on welds in metallic materials - Macroscopic and microscopic examination of welds (ISO 17639:2003)

Essais destructifs des soudures sur matériaux métalliques -  
Examens macroscopique et microscopique des  
assemblages soudés (ISO 17639:2003)

Zerstörende Prüfung von Schweißverbindungen an  
metallischen Werkstoffen - Makroskopische und  
mikroskopische Untersuchungen von Schweißnähten (ISO  
17639:2003)

This European Standard was approved by CEN on 8 August 2013.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

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## **Foreword**

The text of ISO 17639:2003 has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 17639:2013 by Technical Committee CEN/TC 121 "Welding" the secretariat of which is held by DIN.

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 2014, and conflicting national standards shall be withdrawn at the latest by February 2014.

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

This document supersedes EN 1321:1996.

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

### **Endorsement notice**

The text of ISO 17639:2003 has been approved by CEN as EN ISO 17639:2013 without any modification.





# Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds

## 1 Scope

This International Standard gives recommendations for specimen preparation, test procedures and their main objectives for macroscopic and microscopic examination.

## 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.

ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding*

ISO 9956-3, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for arc welding of steels*

ISO 9956-4, *Specification and approval of welding procedures for metallic materials — Part 4: Welding procedure tests for the arc welding of aluminium and its alloys*

ISO/TR 15608, *Welding — Guidelines for a metallic materials grouping system*

ISO/TR 16060, *Destructive tests on welds in metallic materials — Etchants for macroscopic and microscopic examination*

## 3 Terms and definitions

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

### 3.1

#### **macroscopic examination**

examination of a test specimen by the naked eye, or under low magnification (generally less than  $\times 50$ ), with or without etching

### 3.2

#### **microscopic examination**

examination of a test specimen by microscope with a magnification of generally  $\times 50$  to  $\times 500$ , with or without etching

### 3.3

#### **operator**

person who performs the macroscopic and/or microscopic examination

## SS-EN ISO 17639:2013 (E)

### 4 Abbreviations

For the purposes of this document, the following abbreviations apply.

A Macroscopic examination

I Microscopic examination

E Etched

U Unetched

Abbreviations for parent metals shall be in accordance with the grouping systems in ISO 9956-3 for steels and ISO 9956-4 for aluminium and its alloys.

Grouping systems for other materials are given in ISO/TR 15608.

The same grouping systems shall also be used for weld metal.

The abbreviations for etchants should be taken from ISO/TR 16060 whenever applicable.

NOTE A trade mark can be used if ISO/TR 16060 is not applicable.

### 5 Principle

Macroscopic and microscopic examination is used to reveal the macroscopic or microscopic features of a welded joint, usually by the examination of transverse sections.

This is done by visual and/or optical examination of the prepared surface, before or after etching.

### 6 Purpose of the test

The purpose of macroscopic and microscopic examinations is to assess the structure (including grain structure, morphology and orientation, precipitates and inclusions) independently and/or in relation to various cracks and cavities. Sections can also provide a record of sample shape in the planes of the section. Table 1 gives guidance on the assessment of features which can be detected by macroscopic and microscopic examination.

### 7 Removal of test specimens

Test specimens are generally oriented perpendicular to the weld axis (transverse section), including the weld deposit and heat affected zones on both sides of the weld. However, test specimens may also apply to other orientations.

The location, orientation and number of test pieces should be specified prior to testing, for example by reference to an application standard.

Table 1 — Guidelines for assessment of features by microscopic and macroscopic examination

Features	Defect in accordance with ISO 6520-1	Macro examination without etching	Macro examination with etching	Micro examination without etching	Micro examination with etching
1 Hot cracks	100	X	X	X	X
2 Cold cracks	100	X	X	X	X
3 Lamellar tearing	100	X	X	X	X
4 Cavities	200	X	X	X	X
5 Inclusions	300	X	X	X	X
6 Lack of fusion/penetration	400	X	X	X	X
7 Geometrical shape	500	X	X	—	—
8 Heat affected zone	—	—	X	—	X
9 Runs and layers	—	—	X	—	(X)
10 Grain boundary	—	—	—	(X)	X
11 Grain structure	—	—	—	—	X
12 Solidification structure	—	—	X	—	X
13 Joint preparation	—	(X)	X	X	X
14 Direction of rolling/extrusion	—	—	X	—	X
15 Direction of fibre structure (grains)	—	—	X	—	X
16 Segregation	—	—	X	—	X
17 Precipitation	—	—	—	—	X
18 Repair and non-conformance	—	(X)	X	(X)	X
19 Mechanical/thermal effects	—	—	X	—	X

X means features revealed; (X) means features may or may not be revealed

NOTE A number of the features listed may be beyond the resolution of an optical microscope, e.g. precipitates and inclusions.