



**SLOVENSKI STANDARD**  
**SIST EN ISO 17653:2003**  
**01-december-2003**

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Destructive tests on welds in metallic materials - Torsion test of resistance spot welds  
(ISO 17653:2003)

Zestörende Prüfung von Schweißverbindungen an metallischen Werkstoffen -  
Torsionsversuch an Widerstandspunktschweißungen (ISO 17653:2003)

Essais destructifs des soudures sur matériaux métalliques - Essai de torsion de  
soudures par résistance par points (ISO 17653:2003)

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**Ta slovenski standard je istoveten z: EN ISO 17653:2003**

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**ICS:**

25.160.40      Varjeni spoji in vari      Welded joints

**SIST EN ISO 17653:2003**      en

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN ISO 17653**

March 2003

ICS 25.160.40

English version

## Destructive tests on welds in metallic materials - Torsion test of resistance spot welds (ISO 17653:2003)

Essais destructifs des soudures sur matériaux métalliques -  
Essai de torsion de soudures par résistance par points  
(ISO 17653:2003)

Zestörende Prüfung von Schweißverbindungen an  
metallischen Werkstoffen - Torsionsversuch an  
Widerstandspunktschweißungen (ISO 17653:2003)

This European Standard was approved by CEN on 21 November 2002.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN ISO 17653:2003) has been prepared by Technical Committee CEN/TC 121, "Welding", the secretariat of which is held by DS, in collaboration with 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 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

In this European Standard 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

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## EN ISO 17653:2003 (E)

### 1 Scope

This European Standard is applicable to spot welded test specimens with single sheet thicknesses ranging from 0,5 mm to 3,0 mm in steels. It may be used for non-ferrous materials in certain circumstances, see annex A.

The aim of this test is to determine the influence of different steel types, welding parameters and other factors on the deformation characteristics of a spot weld. Using this test, it is possible to determine the weld diameter and the fracture type from fractured specimens. Additionally, the maximum torsion moment (torque) and the corresponding torsion angle can be determined.

### 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).

prEN ISO 14329:1999, *Welding — Destructive testing of welds — Failure types and geometric measurements for resistance spot, seam, and projection welds (ISO/DIS 14329:1999)*.

### 3 Terms and definitions

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For the purposes of this European Standard, the terms and definitions given in prEN ISO 14329:1999 apply.

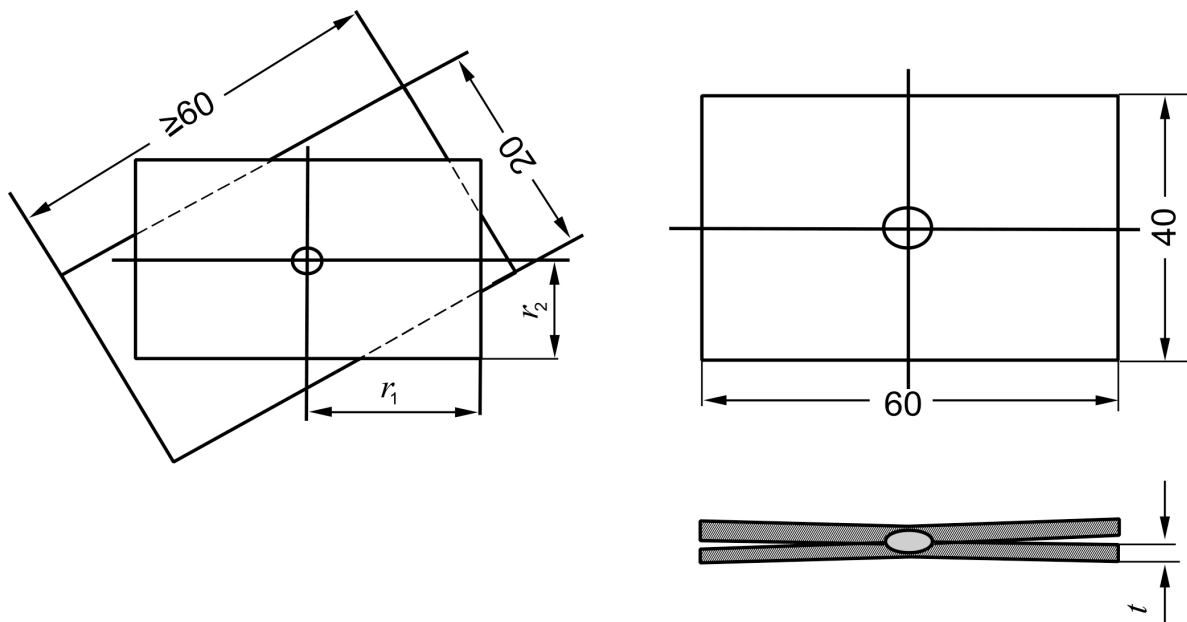
### 4 Specimens

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Specimens for torsion testing are welded individually. In the case of the non-instrumented torsion test, the minimum distance of the spot weld from the edge shall be greater than 10 mm. When using an instrumented torsion device, the minimum distance shall be 20 mm. The specimen dimensions shall be adjusted to the test equipment but shall be adequate to ensure test specimen rigidity (see Figure 1). The spot weld shall be located in the centre of the test specimen (see 5.2.2).

Dimensions in millimetres

**Key**

- $r_1$  distance from the edge to the centre of the spot weld  
 $r_2$  distance from the edge to the centre of the spot weld  
 $t$  material thickness (0,5 mm to 3,0 mm)

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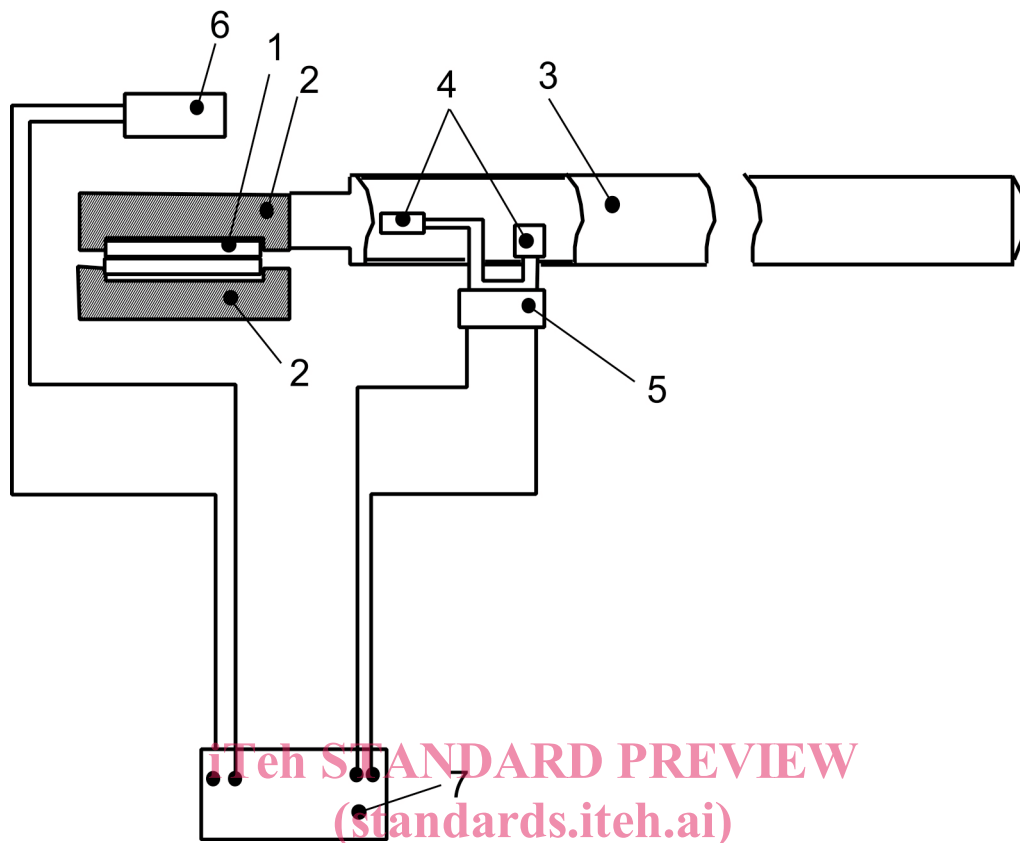
- a) specimens for non instrumental torsion test Non-instrumented
- b) recommended specimen dimensions for instrumented torsion test using a torsion device (manual or mechanized)

Figure 1 — Specimens

## 5 Testing equipment and testing procedure

### 5.1 Manual torsion test using a pair of tongs (workshop test)

For this test, the lower sheet of the specimen is gripped using a specimen gripper similar to that shown in Figure 2. This can be subsequently clamped in a vice. The upper sheet of the specimen is held in a pair of tongs and twisted continuously in one direction until rupture of the spot weld. Bending of the two sheets of the specimen shall be avoided during testing in order to maintain pure torsional loading at the spot weld. This is essential if the test results are to be comparable. This test method only allows weld diameter and fracture type to be determined.

**Key**

- 1 Specimen
- 2 Specimen gripper
- 3 Torque bar
- 4 Strain gauge
- 5 Strain gauge amplifier
- 6 Potentiometer for measuring the torsion angle
- 7 X-Y-recorder

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**Figure 2 – Measuring equipment****5.2 Instrumented torsion test****5.2.1 Manual twisting**

The device used for this variant of torsion test shall be constructed in such a way that the clearance between the edge of the specimen and the tooling shall not exceed 0,3 mm. Positioning of the specimen shall be arranged in such a way that the interface between the two sheets corresponds to the torsional plane of the device and shims, or an adjusting mechanism, may be used for this purpose. Twisting of the specimen shall be possible without tilting or interference between the specimen sheets or the parts of the tooling.

The torsion moment is imposed manually via a lever arm on the rotating part of the testing device (upper part). During testing, the lever arm shall be moved manually at a slow and steady rate of about 90° in 5 s.

Torsion moment and torsion angle are measured during testing using measuring equipment as shown in Figure 2 for example. Permanent records may be made using suitable instrumentation, for example an X-Y recorder.



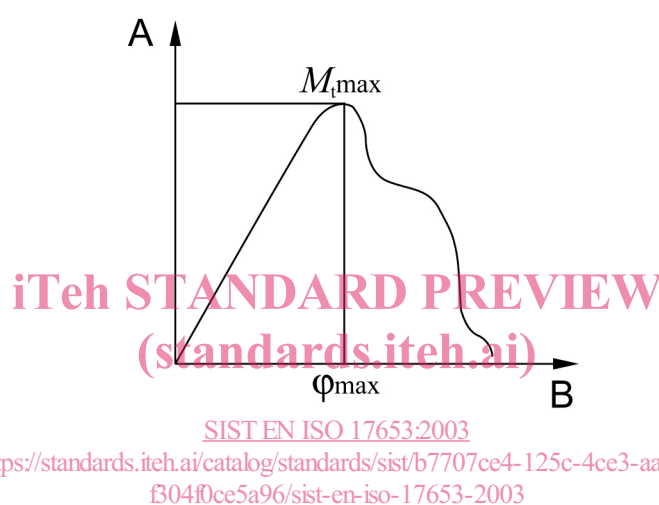
### 5.2.2 Mechanized torsion test

In this variant of the torsion test, the torsion moment is imposed by an electric or electro-hydraulic drive. A steady torsional speed, approximately  $90^\circ$  per 5 s, is recommended. Measurement of the torsion moment and torsion angle is carried out using procedures, described in 5.2.1.

When using either manual or mechanical torsion test procedure the centre of electrode indentation shall not deviate by more than 1,0 mm from the torsional axis of the torsion device (see annex A).

## 6 Evaluation of test results

A torsion moment – torsion angle curve is used to determine the maximum torsion moment and the corresponding torsion angle, see figure 3.



#### Key

- A Torsion moment  $M_t$
- B Torsion angle  $\varphi$

**Figure 3 — Measuring values of the torsion test in the torsion moment – torsion angle curve**

The fracture type for the welds shall be evaluated from the fractured specimens, see prEN ISO 14329.

Torsion moment, torsion angle and fracture type are dependent on the sheet thickness, the weld diameter and the mechanical characteristics of the weld metal, heat-affected zone, and parent metal (see annex A).

The weld diameter shall be determined on the fractured specimen as mean weld diameter.

## 7 Test report

The test report shall refer to this standard and include at least the following information:

- a) welding equipment;
- b) welding conditions;
- c) designation of the materials and sheet thicknesses;
- d) weld diameter "d";