



SLOVENSKI STANDARD
SIST EN 2831:2001
01-junij-2001

Aerospace series - Hydrogen embrittlement of steels - Test by slow bending

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Luft- und Raumfahrt - Wasserstoffversprödung von Stählen - Langsamer Biegeversuch

Série aérospatiale - Fragilisation des aciers par l'hydrogene - Essai par flexion lente

Ta slovenski standard je istoveten z: EN 2831:1993

[SIST EN 2831:2001](https://standards.iteh.ai/catalog/standards/sist/901ed35e-d9cf-4059-a933-87ccf72f35c5/sist-en-2831-2001)

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ICS:

49.025.10 Jekla Steels

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EUROPEAN STANDARD

EN 2831:1993

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 1993

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Descriptors: Aircraft industry, steels, hydrogen embrittlement, bend tests

English version

**Aerospace series - Hydrogen embrittlement of
steels - Test by slow bending**Série aérospatiale - Fragilisation des aciers
par l'hydrogène - Essai par flexion lenteLuft- und Raumfahrt - Wasserstoffversprödung
von Stählen - Langsamer Biegeversuch**(standards.iteh.ai)**

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This European Standard was approved by CEN on 1993-02-19. 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 Central Secretariat or to any CEN member.

The European Standards exist 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.

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

CENEuropean Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has successively received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

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 August 1993, and conflicting national standards shall be withdrawn at the latest by August 1993.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard :
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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SIST EN 2831:2001
AEROSPACE MANUFACTURERS ASSOCIATION
AECMA
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1 Scope

This standard specifies the test method by slow bending, which is used to assess the hydrogen embrittlement of steels during chemical or electrolytic surface treatments.

This test is also used to verify the recovery of the initial ductility during de-embrittlement treatments.

It is applicable whenever referenced.

2 Apparatus

Bending test machine with the following characteristics :

- the chucks shall avoid any effects due to clamping in the region of cracking,
- one of the chucks shall be fixed and the other movable ; the fixed chuck shall be fitted with an interchangeable bending block the diameter of which may be between 2 mm and 6 mm (see figure 1) ; the movable chuck shall have a deflection rate which can be adjusted between 4 ° /min and 18 °/min,
- be fitted with a device allowing to measure the angles α_0 , α_{f1} and α_{f2} (see figures 2 to 4) with a precision of $\pm 0,5^\circ$,
- be fitted with a magnifier of 10 times in order to reveal the occurrence of the first crack.

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3 Test specimens

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They shall : <https://standards.iteh.ai/catalog/standards/sist/901ed35e-d9cf-4059-a933-87ccf72f35c5/sist-en-2831-2001>

- be cut from a bar or sheet along the grain direction,
- have the following dimensions :

| | |
|---|------------------|
| . length : | 180 mm to 200 mm |
| . width : | 15 mm to 20 mm |
| . thickness : | 1,8 mm to 4 mm |
| . straightness deflection over the length : | < 0,25 mm, |
- be machined along the grain direction to a surface roughness $Ra \leq 1,6 \mu\text{m}$, then submitted to a stress relief of at least 2 h at 150 °C without decarburization.

4 Procedure

Each bending angle (α_0 , α_{f1} , if specified, and α_{f2}) is determined successively on the same test specimen (see figures 2 to 4). At least three test specimens shall be used.

The test specimens shall be in the same condition as the parts they represent.

NOTE 1 : Test specimens, possibly of a different steel grade, with a higher strength than the pieces may be used.

NOTE 2 : The fracture angle of the test specimens per bending shall not exceed the deflection angle of the movable chuck.

The diameter of the bending block and the deflection rate of the movable chuck shall be determined according to the material and thickness of the test specimen.

Place the test specimen in the test machine (see figure 1).

Bend the test specimen under the specified deflection rate of the movable chuck until the first crack occurs in the centre part of the test specimen and measure the bending angles α_0 , α_{f1} , if specified, and α_{f2} .

Angle α_{f1} shall be measured within max. 1 h after surface treatment.

5 Expression of results

- ductility after surface treatment : $\alpha_{f1} / \alpha_0 \times 100$, in %
- final ductility : $\alpha_{f2} / \alpha_0 \times 100$, in %

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6 Fault sanction

The value of final ductility shall be specified in the process standard.

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7 Test report

It shall include the following :

- reference to this standard;
- reference numbers of the test specimens;
- nature of the coating;
- thickness of the coating;
- diameter of the bending block and deflection rate of the movable chuck;
- values of bending angles measured;
- test result.

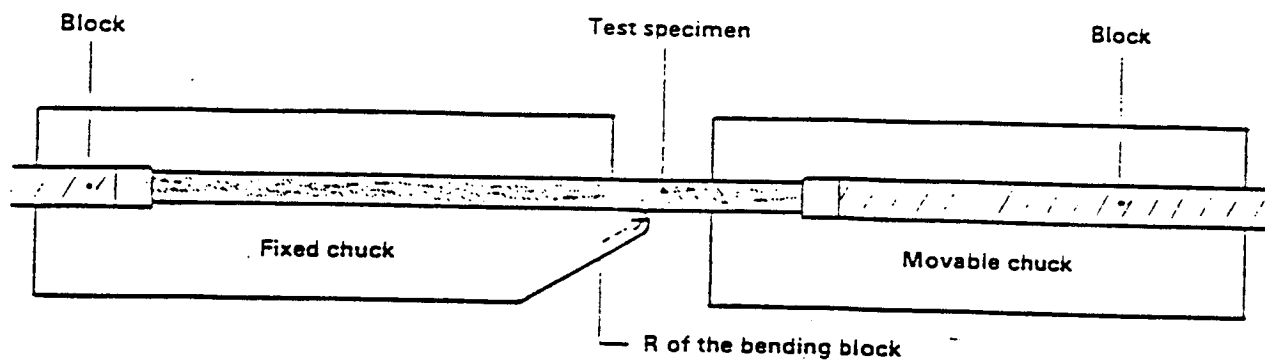
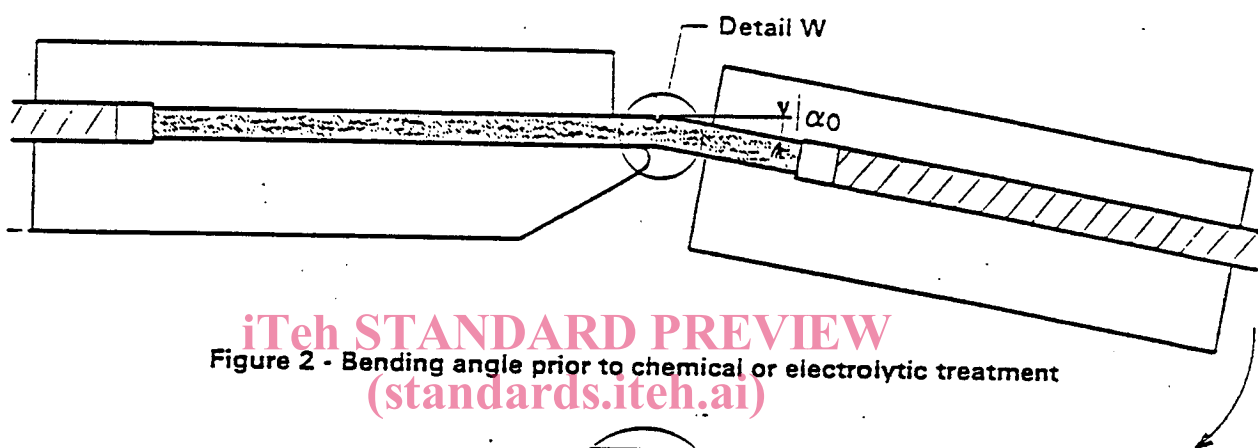


Figure 1 - Placing of the test specimen before testing



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Figure 2 - Bending angle prior to chemical or electrolytic treatment
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Detail W - Mirror-view

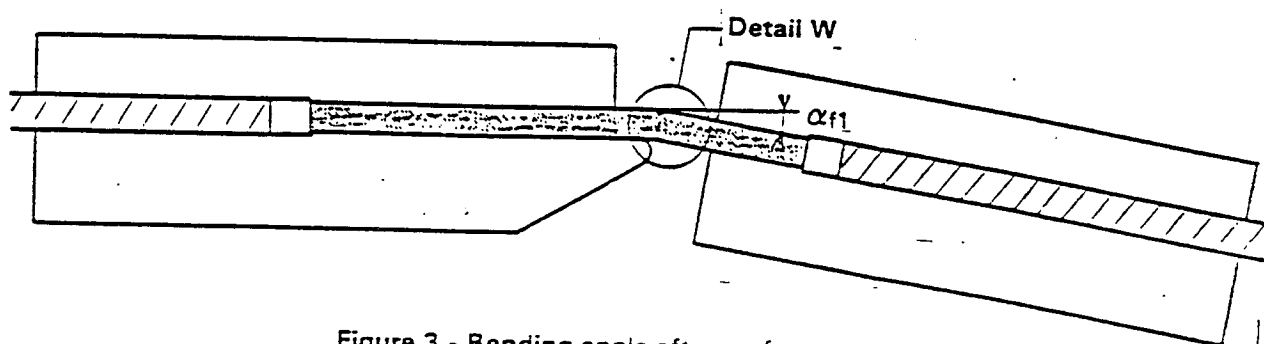


Figure 3 - Bending angle after surface treatment

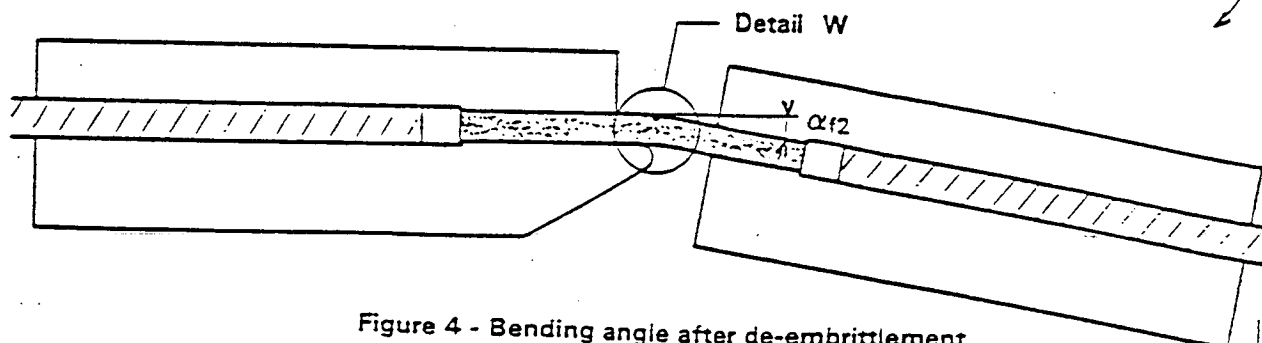


Figure 4 - Bending angle after de-embrittlement