Fasteners - Preloading test for the detection of hydrogen embrittlement - Parallel bearing surface method

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EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN ISO 15330:2000 sisaldab Euroopa standardi EN ISO 15330:1999 ingliskeelset teksti. Käesolev dokument on jõustatud 18.02.2000 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN ISO 15330:2000 consists of the English text of the European standard EN ISO 15330:1999. This document is endorsed on 18.02.2000 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This International Standard defines a preloading test which is able to detect the occurance of hydrogen embrittlement of fasteners at room temperature.	**Scope:** This International Standard defines a preloading test which is able to detect the occurance of hydrogen embrittlement of fasteners at room temperature.

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Võtmesõnad: detection, fasteners, hydrogen embrittlement, tests

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Fasteners

Preloading test for the detection of hydrogen embrittlement – Parallel bearing surface method
(ISO 15330 : 1999)

Eléments de fixation – Essai de précharge pour la détection de la fragilisation par l'hydrogène – Méthode des plaques parallèles
(ISO 15330 : 1999)

Verbindungselemente – Verspannungsversuch zur Entdeckung von Wasserstoffversprödung – Verfahren mit parallelen Auflageflächen
(ISO 15330 : 1999

This European Standard was approved by CEN on 1999-07-21.

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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.

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

International Standard

ISO 15330 : 1999 Fasteners – Preloading test for the detection of hydrogen embrittlement – Parallel bearing surface method,

which was prepared by ISO/TC 2 'Fasteners' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 185 'Threaded and non-threaded mechanical fasteners and accessories', the Secretariat of which is held by DIN, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by March 2000 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 15330 : 1999 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

Contents

Introduction

When atomic hydrogen enters steels, it can cause loss of ductility or load-carrying ability, cracking (usually as submicroscopic cracks) or catastrophic brittle failures at applied stresses well below the yield strength or even the normal design strength for the alloys. This phenomenon often occurs in alloys that show no significant loss in ductility when measured by conventional tensile tests, and is frequently referred to as hydrogen-induced delayed brittle failure, hydrogen stress cracking or hydrogen embrittlement. The hydrogen can be introduced during heat treatment, gas carburizing, cleaning, pickling, phosphating, electroplating and in the service environment as a result of cathodic protection or corrosion reactions. Hydrogen can also be introduced during fabrication, for example during roll forming, machining, and drilling due to coolant or lubricant break-down as well as during welding or brazing operations.

1 Scope

This International Standard specifies a preloading test which is able to detect the occurence of hydrogen embrittlement of fasteners at room temperature.

This test is applicable to

— metric bolts, screws and studs;

— thread rolling screws;

— self-tapping screws;

— self-drilling screws;

— nuts;

— washers

which are made of steel and are under tensile stress.

The test shall be carried out within a temperature range of 10 °C to 35 °C.

The test is suitable only for in-process control and may be carried out after any step of the manufacturing process. It is not intended as an acceptance test. It is capable of assessing differences or changes in processing conditions or techniques and to determine the effectiveness of the various processing steps including pre- and post-coating treatments (baking) to reduce the mobile hydrogen in the fasteners.

This test does not relieve the manufacturer or processor from the responsibility of imposing and monitoring suitable process control.

NOTE The chance of detecting hydrogen embrittlement decreases significantly if the test is started more than 24 h after the last step of manufacturing process. Therefore, in normal cases this test is not suitable for acceptance testing.

Special attention shall be given to the reference test in clause 7.3.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 273:1979, *Fasteners — Clearance holes for bolts and screws.*

ISO 2702:1992, *Heat-treated steel tapping screws — Mechanical properties.*

ISO 7085:1999, *Mechanical and performance requirements of case hardened and tempered metric thread rolling screws.*

ISO 10666:1999, *Drilling screws with tapping screw thread — Mechanical and functional properties.*

3 Terms and definitions

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

3.1
susceptibility to hydrogen embrittlement
characteristic of a steel fastener to display brittle failure due to the presence of mobile hydrogen and when subjected to a significant degree of tensile stress and/or adverse service conditions

NOTE 1 With increasing susceptibility to hydrogen embrittlement, the critical amount of mobile hydrogen which may cause brittle failure decreases markedly.

NOTE 2 After the manufacturing process, susceptibility to hydrogen embrittlement cannot be reduced or changed into an unsusceptible condition, even by any post-coating heat treatment (baking).

3.2
risk of hydrogen embrittlement
risk of failure which arises if fasteners made from steel which are susceptible to hydrogen embrittlement absorb hydrogen and are subjected to tensile stress and/or residual tensile stress

NOTE The risk of hydrogen embrittlement can be reduced when in the relevant process steps hydrogen supply is minimized and/or when suitable post-coating heat treatment is carried out to enable hydrogen to effuse and/or to trap hydrogen irreversibly in the steel.

3.3
manufacturing lot
quantity of fasteners of a single designation including product grade, property class and size, manufactured from bar, wire, rod or flat product from a single cast, processed through the same or similar steps at the same time or over a continuous time period through the same heat treatment and/or coating process, if any

Same heat treatment or coating process means:

— for a continuous process, the same treatment cycle without any setting modification;

— for a discontinuous process, the same treatment cycle for identical consecutive loads (batches).

NOTE The manufacturing lot may be split into a number of manufacturing batches for processing purposes and then reassembled into the same manufacturing lot.

3.4
manufacturing batch
quantity of identical fasteners from the same manufacturing lot processed together at one time

4 Principle

The preloading test is carried out in suitable test devices. The fasteners are subjected to stress in the range of the yield point or the breaking torque either by torquing with a mating nut (or bolt) or by driving in a pretapped plate, see Figures 1 to 3. Other loading systems and fixtures are permissible, provided that the required stress in the range of the yield point or breaking torque of the relevant fastener can be achieved. The stress or torque is held at least for 48 h. After every 24 h the fasteners are retightened to the initial stress or torque and at the same time checked if failure due to hydrogen embrittlement has occurred.