SLOVENSKI STANDARD
SIST EN ISO 16148:2006

01-oktober-2006

Plinske jeklenke ï Ponovno polnljive plinske jeklenke iz celega ï Preskus z zvoļ no emisijo kot periodiļ ni pregled (ISO 16148:2006)

Gas cylinders - Refillable seamless steel gas cylinders - Acoustic emission testing (AT) for periodic inspection (ISO 16148:2006)

Gasflaschen - Wiederbefüllbare, nahtlose Gasflaschen aus Stahl - Schallemissionsverfahren bei der wiederkehrenden Prüfung (ISO 16148:2006)

Bouteilles a gaz - Bouteilles a gaz rechargeables en acier sans soudures - Essai par émission acoustique pour contrôle periodique (ISO 16148:2006)

Ta slovenski standard je istoveten z: **EN ISO 16148:2006**

ICS:

23.020.30	Tlaļ ne posode, plinske jeklenke	Pressure vessels, gas cylinders

SIST EN ISO 16148:2006 **en**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN ISO 16148

May 2006

ICS 23.020.30

English Version

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This European Standard was approved by CEN on 3 April 2006.

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

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Foreword

This document (EN ISO 16148:2006) has been prepared by Technical Committee ISO/TC 58 "Gas cylinders" in collaboration with Technical Committee CEN/TC 23 "Transportable gas cylinders", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 16148:2006 has been approved by CEN as EN ISO 16148:2006 without any modifications.

INTERNATIONAL STANDARD

ISO 16148

First edition
2006-05-01

Gas cylinders — Refillable seamless steel gas cylinders — Acoustic emission testing (AT) for periodic inspection

Bouteilles à gaz — Bouteilles à gaz rechargeables sans soudure — Essais d'émmision acoustique pour contrôle périodique

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 16148 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 4, *Operational requirements for gas cylinders*, in collaboration with Technical Committee CEN/TC 23, *Transportable gas cylinders*, of the European Committee for Standardization.

Introduction

In recent years, new non-destructive examination (NDE) techniques have been successfully introduced as an alternative to the conventional re-testing procedures of gas cylinders, tubes and other cylinders.

One of the alternative NDE methods for certain applications is acoustic emission testing (AT), which has proved to be an acceptable testing method applied during periodic inspection in some countries.

The test method requires pressurization to a level greater than the normal filling pressure.

The pressurization medium may be either gas or liquid.

Acoustic emission (AE) measurements are used to detect and locate emission sources. Other NDE methods are needed to evaluate the significance of AE detected sources. Procedures for other NDE techniques are beyond the scope of this International Standard. For example, shear wave, angle beam ultrasonic inspection is commonly used to establish the exact position and dimensions of flaws that produce AE.

This International Standard includes two methods of AT and, for the purpose of differentiation, the methods are addressed as Method A and Method B (see Clause 3).

With the agreement of the testing and certifying body approved by the competent authority of the country of approval, the hydraulic pressure test of cylinders and tubes may be replaced by an equivalent method based on acoustic emission.

Gas cylinders — Refillable seamless steel gas cylinders — Acoustic emission testing (AT) for periodic inspection

1 Scope

This International Standard is a guideline for using acoustic emission testing (AT) during re-qualification of seamless steel cylinders and tubes of water capacity up to 3 000 l used for compressed and liquefied gases. For cylinders below 20 l additional precautions may be taken due to the potential reflections from the ends. This examination provides indications and locations that should be evaluated by another examination for a possible flaw in the cylinder. This International Standard covers monolithic steel cylinders.

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 6406, *Gas cylinders — Seamless steel gas cylinders — Periodic inspection and testing*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

EN 1330-9, *Non-destructive testing — Terminology — Part 9: Terms used in acoustic emission testing*

EN 13477-1, *Non-destructive testing — Acoustic emission — Equipment characterisation — Part 1: Equipment description*

EN 13477-2, *Non-destructive testing — Acoustic emission — Equipment characterisation — Part 2: Verification of operating characteristic*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1330-9 and the following apply.

3.1
fracture critical flaw
defect that is large enough to exhibit unstable crack growth under certain service conditions

3.2
working pressure
settled pressure at a uniform temperature of 288 K (15 °C) for a full gas cylinder with the maximum permissible charge of compressed gas

NOTE 1 In North America service pressure is often used to indicate a similar condition, usually at 21,1 °C (70 °F).

NOTE 2 For compressed gases, this value is usually stamped on the cylinder.

3.3
normal filling pressure
level to which a receptacle is pressurized during filling

NOTE This is usually greater than the marked working pressure due to the heat of compression.

3.4
acoustic emission test pressure
AE test pressure
maximum pressure at which acoustic emission testing is performed

3.5
maximum allowable pressure
maximum pressure a receptacle may experience

NOTE For liquefied gases, this is the developed pressure at the maximum service temperature (e.g. 65 °C).

3.6
acoustic emission pressure test range
range of pressure during which acoustic emission is monitored

3.7
Method A
acoustic emission testing performed during pneumatic pressurization to at least 110 % of the normal filling pressure

3.8
Method B
acoustic emission testing performed during the hydrostatic proof pressurization to the re-test pressure

3.9
secondary AE sources
emissions other than actual crack propagation and plastic deformation

NOTE Contact between flaw surfaces as the cylinder expands, fracture or rubbing of mill scale within a flaw as the cylinder expands are examples of secondary AE sources.

4 Operational principles

When cylinders containing flaws are pressurized, stress waves (AE) can be produced by several different sources (e.g. secondary sources or actual propagation of cracks). These sources can produce AE at pressures less than, equal to or greater than working pressure. The stress waves travel throughout the structure.

Piezoelectric sensors mounted on a cylinder surface respond to stress waves. They are connected to a signal processor, which records AE signal parameters associated with the passage of the waves under the sensor. Stress waves travel at average speeds. With at least two sensors, one mounted at each end of a cylinder, the approximate location of AE sources is derived from the measured arrival time of stress waves at the sensors.

If measured emissions exceed the specified levels over a linear distance on the cylinder, then such locations shall undergo a secondary inspection (for example, ultrasonic examination) in order to verify the presence of flaws and to measure flaw dimensions. From this secondary inspection, if the flaw depth exceeds the specified limit (that is, a limit based on a number of factors, i.e. cylinder material, wall thickness, fatigue crack growth estimates, fracture critical flaw depth calculations and any practical experience), then the cylinder shall be removed from service.

If after the examination a recalibration proves negative, the relevant cylinder shall be re-examined by a non-destructive examination (NDE) method other than AE Method A.