

**LPG equipment and accessories -  
Transportable refillable welded steel  
cylinders for LPG - Alternative design  
and construction**

LPG equipment and accessories - Transportable  
refillable welded steel cylinders for LPG - Alternative  
design and construction

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 14140:2003+A1:2007 sisaldab Euroopa standardi EN 14140:2003+A1:2006 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 29.01.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 14140:2003+A1:2007 consists of the English text of the European standard EN 14140:2003+A1:2006.</p> <p>This document is endorsed on 29.01.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This European Standard specifies minimum requirements concerning material, design, construction and workmanship, procedure and test at manufacture of transportable refillable welded steel Liquefied Petroleum Gas (LPG) cylinders of water capacity from 0,5 l up to and including 150 l exposed to ambient temperatures, allowing alternative design and construction methods to those required in EN 1442. This European Standard applies only to cylinders with a circular cross-section. All pressures are gauge unless otherwise stated.</p>	<p><b>Scope:</b> This European Standard specifies minimum requirements concerning material, design, construction and workmanship, procedure and test at manufacture of transportable refillable welded steel Liquefied Petroleum Gas (LPG) cylinders of water capacity from 0,5 l up to and including 150 l exposed to ambient temperatures, allowing alternative design and construction methods to those required in EN 1442. This European Standard applies only to cylinders with a circular cross-section. All pressures are gauge unless otherwise stated.</p>
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ICS 23.020.30

**Võtmesõnad:** leak tests, liquefied petroleum gases, repair, re-usable, reusable equipment, routine tests, safety, safety devices, safety engineering, safety requirements, safety valves, specification (approval), specifications, steel cylinders, steels, testing, welded structures

ICS 23.020.30

English Version

LPG equipment and accessories - Transportable refillable  
welded steel cylinders for LPG - Alternative design and  
construction

Equipements pour GPL et leurs accessoires - Bouteilles en  
acier soudé transportables et rechargeables pour gaz de  
pétrole liquéfié (GPL) - Autres solutions en matière de  
conception et construction

Flüssiggas-Geräte und Ausrüstungsteile - Ortsbewegliche,  
wiederbefüllbare, geschweißte Flaschen aus Stahl für  
Flüssiggas (LPG) - Alternative Gestaltung und Konstruktion

This European Standard was approved by CEN on 10 July 2003 and includes Amendment 1 approved by CEN on 2 November 2006.

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.

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.

CEN members are the national standards bodies of 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.



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## Foreword

This document (EN 14140:2003+A1:2006) has been prepared by Technical Committee CEN/TC 286 "Liquefied Petroleum Gas equipment and accessories", the secretariat of which is held by NSAI.

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 June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

This document includes Amendment 1, approved by CEN on 2006-11-02.

This document supersedes EN 14140:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags  $\boxed{A_1}$   $\boxed{A_1}$ .

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the objectives of the framework Directives on Transport of Dangerous Goods.

This European Standard has been submitted for reference into the RID and/or in the technical annexes of the ADR.

Therefore the standards listed in the normative references and covering basic requirements of the RID/ADR not addressed within the present standard are normative only when the standards themselves are referred to in the RID and/or in the technical annexes of the ADR.

Annex A is normative.

This document includes a Bibliography.

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.

## Introduction

This European Standard calls for the use of substances and procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

It has been assumed in the drafting of this European Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

This standard permits the use of new and higher strength steels and has the potential for cylinders to be thinner than the minimum thickness related to diameter, compared with cylinders in accordance with EN 1442. These changes in technology are justified by requiring a series of performance tests, including impact testing, to demonstrate the adequacy of the calculated pressure thickness for service and transport considerations.

**A1** NOTE Reference should also be made to EN 14913, which requires the cylinder manufacturer to perform additional tests to determine the rejection limits for in-service damage and to include these limits in the documentation for the cylinder. **A1**

## 1 Scope

This European Standard specifies the minimum requirements for the design, construction and testing during manufacture of transportable refillable welded steel Liquefied Petroleum Gas (LPG) cylinders, of water capacity from 0,5 l up to and including 150 l, exposed to ambient temperatures. It allows alternative design and construction methods to those required in EN 1442.

This European Standard applies only to cylinders with a circular cross-section.

All pressures are gauge unless otherwise stated.

## 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).

**A1** *deleted text* **A1**

EN 287-1, *Approval testing of welders - Fusion welding – Part 1: Steels.*

**A1** *deleted text* **A1**

**A1** *deleted text* **A1**

EN 462-1, *Non-destructive testing - Image quality of radiographs – Part 1: Image quality indicators (wire type) - Determination of image quality value.*

EN 462-2, *Non-destructive testing - Image quality of radiographs – Part 2: Image quality indicators (step/hole type) - Determination of image quality value.*

EN 473:2000, *Non-destructive testing - Qualification and certification of NDT personnel - General principles.*

## EN 14140:2003+A1:2006 (E)

EN 895, *Destructive tests on welds in metallic materials – Transverse tensile test.*

EN 910, *Destructive tests on welds in metallic materials – Bend tests.*

**A1** deleted text **A1**

**A1** EN 962:1996, *Transportable gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design, construction and tests.* **A1**

EN 970, *Non-destructive examination of fusion welds - Visual examination.*

EN 1321, *Destructive tests on welds in metallic materials - Macroscopic and microscopic examination of welds.*

EN 1418, *Welding personnel - Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials.*

EN 1435:1997, *Non-destructive examination of welds - Radiographic examination of welded joints.*

**A1** deleted text **A1**

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature.*

EN 10028-7, *Flat products made of steels for pressure purposes - Part 7: Stainless steels.*

EN 10120, *Steel sheet and strip for welded gas cylinders.*

**A1** deleted text **A1**

**A1** EN 10204:2004, *Metallic products – Types of inspection documents.* **A1**

**A1** prEN 14894, *LPG equipment and accessories – LPG cylinder and drum marking.*

EN 14913, *LPG equipment and accessories – Transportable refillable welded steel cylinders for Liquefied Petroleum Gas (LPG) – Alternative design and construction – Procedure for checking before, during and after filling.*

EN ISO 643, *Steels – Micrographic determination of the apparent grain size (ISO 643:2003).* **A1**

EN ISO 2409: 1994, *Paints and varnishes - Cross-cut test (ISO 2409:1992).*

EN ISO 2812-2, *Paints and varnishes - Determination of resistance to liquids - Part 2: Water immersion method (ISO 2812-2:1993).*

EN ISO 3231:1997, *Paints and varnishes - Determination of resistance to humid atmospheres containing sulfur dioxide (ISO 3231:1993).*

EN ISO 6520-1, *Welding and allied processes - Classification of geometric imperfections in metallic materials - Fusion welding (ISO 6520-1:1998).*

EN ISO 7253, *Paints and varnishes - Determination of resistance to neutral salt spray (fog) (ISO 7253:1996)*

**A1** EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 1: Arc welding (ISO 15609-1:2004).*

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test (ISO 15613:2004).*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004).* **A1**

ISO 4624, *Paints and varnishes. Pull-off test for adhesion.*

ISO 11997-2, *Paints and varnishes - Determination of resistance to cyclic corrosion conditions - Part 2: Wet (salt fog)/dry/humidity/UV light.*

### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

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

##### 3.1.1

##### **yield stress**

upper yield strength  $R_{eh}$  for carbon steels or 0,2% proof stress (non-proportional elongation),  $R_{p0,2}$ , for steels that do not exhibit a defined yield, and 1% proof stress for stainless steels,  $R_{p1,0}$

##### 3.1.2

##### **normalised**

condition resulting from heat treatment in which a finished cylinder is heated to a uniform temperature above the upper critical point ( $Ac_3$ ) of the steel and then cooled under controlled conditions

##### 3.1.3

##### **stress relieved**

condition resulting from heat treatment in which a finished cylinder is heated to a uniform temperature below the lower critical point ( $Ac_1$ ) of the steel and cooled in a still atmosphere, the object of which is to reduce the residual stresses without altering the metallurgical structure of the steel

#### 3.2 Symbols

- a* Calculated minimum thickness of the cylindrical shell, in millimetres.
- A* Percentage elongation after fracture.
- b* Calculated minimum thickness of the end of the cylinder, in millimetres.
- C* Shape factor for ends (see Table 1 and Figure 2).
- D* Outside diameter of the cylinder as given in the design drawing (see Figure 1), in millimetres.
- $D_p$  Outside diameter of a bend tests former (see Figure 8), in millimetres.
- e* Actual thickness of the material used, in millimetres.
- h* Height, in millimetres, of the cylindrical part of the end (see Figure 1).
- H* Outside height, in millimetres, of the domed part of the end (see Figure 1).
- J* Stress reduction factor.
- l* Length of the cylinder, in millimetres.
- $L_0$  Original gauge length of the test piece, in accordance with EN 10002-1, in millimetres.
- n* Ratio of diameter of bend test former to the thickness of the test piece, (see Table 5).