



SLOVENSKI STANDARD SIST EN 1440:2008

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LPG equipment and accessories - Periodic inspection of transportable refillable LPG cylinders

Flüssiggas-Geräte und Ausrüstungsteile - Wiederkehrende Prüfung von ortsbeweglichen, wiederbefüllbaren Flaschen für Flüssiggas (LPG)

Bouteilles en acier soudé transportables et rechargeables pour gaz de pétrole liquéfié (GPL) - Requalification périodique

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LPG equipment and accessories - Periodic inspection of transportable refillable LPG cylinders

Bouteilles en acier soudé transportables et rechargeables
pour gaz de pétrole liquéfié (GPL) - Requalification
périodique

Flüssiggas-Geräte und Ausrüstungsteile - Wiederkehrende
Prüfung von ortsbeweglichen, wiederbefüllbaren Flaschen
für Flüssiggas (LPG)

This European Standard was approved by CEN on 6 January 2008.

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 CEN 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 CEN Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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EN 1440:2008 (E)**Foreword**

This document (EN 1440:2008) 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of an identical text or by endorsement, at the latest by August 2008, and conflicting national standards shall be withdrawn at the latest by August 2008.

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

This European Standard has been submitted for reference into the RID (Regulations concerning the International Carriage of Dangerous Goods by Rail) and/or in the technical annexes of the ADR (European Agreement concerning the international carriage of Dangerous goods by Road). 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.

The main changes between this version of the standard and the 2005 version is that this version combines EN 1440:2005, EN 14767:2005, EN 14795:2005 and EN 14914:2005 into a single standard.

This European Standard supersedes EN 1440:2005, EN 14767:2005, EN 14795:2005 and EN 14914:2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, 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 the United Kingdom.

Introduction

The primary objective of the periodic inspection of transportable refillable liquefied petroleum gas (LPG) cylinders is that, at the completion of the tests, the cylinders can be re-introduced into service for a further period of time.

The very large populations of traditional steel LPG cylinders in use have led to the development of alternative methods of inspection.

This European Standard has now been prepared to reflect the current state of the art for period inspecting of LPG cylinders, and is based on the operating experience of many hundreds of millions of cylinder years of service.

This European Standard calls for the use of substances and procedures that can 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.

Where judgements are called for, it has been assumed that they are made by competent persons who have been trained specifically for the tasks.

This standard is a combination of EN 1440:2005, with EN 14767:2005, EN 14795:2005 and EN 14914:2005.

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EN 1440:2008 (E)**1 Scope**

This European Standard specifies procedures for periodic inspection and testing, for transportable refillable LPG cylinders with a water capacity from 0,5 l up to and including 150 l.

This standard is applicable to the following:

- welded and brazed steel LPG cylinders with a specified minimum wall thickness (see EN 1442 and EN 12807 or the equivalent standard);
- welded steel LPG cylinders without specified minimum wall thickness (see EN 14140:2003+A1 or the equivalent standard);
- welded aluminium LPG cylinders (see EN 13110 or the equivalent standard);
- composite LPG cylinders (see EN 14427 or the equivalent standard).

This standard is intended to be applied to cylinders complying with RID/ADR (including pi marked cylinders) and also to existing non RID/ADR cylinder populations.

This standard does not apply to cylinders permanently installed in vehicles.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 837-1, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 837-3, *Pressure gauges - Part 3: Diaphragm and capsule pressure gauges - Dimensions, metrology, requirements and testing*

EN 1439, *LPG equipment and accessories - Transportable refillable welded and brazed steel Liquefied Petroleum Gas (LPG) cylinders - Procedure for checking before, during and after filling*

EN 1442, *LPG equipment and accessories - Transportable refillable welded steel cylinders for LPG - Design and construction*

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

EN 12816, *Transportable refillable steel and aluminium LPG cylinders – Disposal*

EN 13152, *Specification and testing of LPG cylinder valves - Self closing*

EN 13153, *Specification and testing of LPG cylinder valves - Manually operated*

EN 14140:2003+A1:2006, *LPG equipment and accessories - Transportable refillable welded steel cylinders for LPG - Alternative design and construction*

EN 14427:2004, *Transportable refillable fully wrapped composite cylinders for Liquefied Petroleum Gases (LPG) - Design and Construction*

EN 14894, *LPG equipment and accessories - Cylinder and drum marking*

EN 14912, *LPG equipment and accessories – Inspection and maintenance of LPG cylinder valves at time of periodic inspection of cylinders*

ISO 9162, *Petroleum products - Fuels (class F) - Liquefied petroleum gases - Specifications*

3 Terms and definitions

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

3.1

competent body

person or corporate body defined by the national authority, which by combination of appropriate qualification, training, experience, and resources, is able to make objective judgements on the subject

3.2

competent person

person who by a combination of training, experience and supervision is able to make objective judgements on the subject

3.3

periodic inspection

activities carried out at defined intervals, such as examining, measuring, testing or gauging the characteristics of a cylinder and comparing these with specified requirements and marking to attest conformity

3.4

production batch

group of cylinders made consecutively during the same year, by the same manufacturer using the same manufacturing techniques to the same design, nominal size and material specifications on the same production machinery and subject to the same heat treatment conditions

NOTE In this context, "consecutively," need not imply continuous production.

3.5

protected cylinder

metallic cylinder fully covered with protection against impact and external corrosion so that the cylinder wall cannot be seen

NOTE This is not a composite cylinder; see EN 14427 and Figure G.1

3.6

casing

permanently attached sleeve covering part of, or the whole of the pressure containing envelope of a composite cylinder, usually incorporating a foot ring and a shroud

NOTE Permanently attached means that casing cannot be removed during service without destruction, or by using special tools.

3.7

LPG (liquefied petroleum gas)

mixture of predominantly butane or propane with traces of other hydrocarbon gases classified in accordance with UN number 1965, hydrocarbon gases mixture, liquefied, NOS or UN number 1075, petroleum gases, liquefied

NOTE In some countries, UN number 1011, 1978 may also be designated LPG.

EN 1440:2008 (E)**3.8****tare mass**

sum of the mass of the empty cylinder, the mass of the valve including a dip tube where fitted, and the mass of all other parts that are permanently attached to the cylinder when it is being filled, e.g. fixed valve guard

4 Written scheme of inspection

The interval between periodic inspections shall be dependent on the content of a written scheme.

NOTE A written scheme, describes work procedures, criteria, responsibilities and other minimum requirements.

The interval between periodic inspections for welded steel, brazed steel and welded aluminium LPG cylinders shall be 10 years.

However, for welded and brazed steel LPG cylinders, this period can be extended to 15 years, provided the conditions of Annex E are fully met and approval from the relevant competent authority(ies) has been given.

For protected cylinders the interval is determined in accordance with G.4.1.

For composite cylinders, the determination of the interval between periodic inspections shall depend on the content of a written scheme that shall be approved by a competent authority.

Annex F gives guidance on conditions to obtain approval for 10-year interval. The inspection procedures to be applied shall be selected from the alternatives given in Clause 5.

5 Procedures for periodic inspection**5.1 General**

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Procedures for periodic inspection shall consist of inspections as described in Table 1.

Table 1 —Procedures for periodic inspection

Cylinders	Procedures
Welded and brazed steel LPG cylinders ^a	- external visual inspection as described in 5.2 and, - additionally, at least one of the tests described in 5.3.
Welded aluminium LPG cylinders and composite LPG cylinders.	- external visual inspection as described in 5.2, - internal visual inspection as described in 5.3.3.2 ^b , and - additionally, at least one of the following tests: - hydraulic test (see 5.3.2), - pneumatic proof and leak test (see 5.3.4).
^a An alternative procedure for periodic inspection of protected cylinders is described in 5.4.	
^b For transparent composite cylinders, the internal visual inspection may be made from outside.	

Periodic inspections/tests shall be carried out by a competent person under the control of a body approved by a competent authority.

Cylinders rejected shall be segregated and be either reconditioned, re-tested or rendered unserviceable.

The decision to render a cylinder unserviceable may be taken at any stage during the periodic inspection procedure. With agreement by the owner, a cylinder shall be rendered unserviceable in accordance with EN 12816 (where applicable), so that it cannot be re-issued into service as a pressure vessel.

NOTE In some countries, render unserviceable means scrapping.

5.2 External visual inspection

5.2.1 Preparation for external visual inspection

- a) If required, the cylinder shall be cleaned and have all loose coatings or labels, corrosion products, tar, oil or other foreign matter removed from its external surface.
- b) Care shall be taken to avoid damaging the cylinder.
- c) When cylinders are treated by a process that might remove cylinder material, the competent body shall decide whether a thickness test is required, e.g. ultrasonic thickness check.

NOTE Cleaning methods may be wire brushing, shot blasting (in accordance with EN ISO 8504 all parts and EN ISO 8501-1), water jet cleaning, chemical cleaning or other suitable methods.

5.2.2 Inspection procedure

Welded steel, brazed steel and welded aluminium LPG cylinders, shall be inspected for:

- a) dents, cuts, gouges, bulges, cracks, laminations or punctures, applying the criteria for rejection in Annex A, Annex B and Annex C as appropriate;
- b) corrosion, giving special attention to areas where water can be trapped, at the base of the cylinder, the junction between the cylindrical shell and the foot-ring, the cylindrical shell and the valve guard or shroud, and in particular hidden corrosion (e.g. data plate) applying the criteria for rejection given in Annex A, Annex B and Annex C as appropriate;
- c) other defects (e.g. depressed bung or fire damage) applying the criteria for rejection given in Annex A, Annex B and Annex C as appropriate;
- d) integrity of all permanent attachments;
- e) integrity of all mandatory permanent markings.

Composite cylinders shall be inspected for:

- f) cuts, gouges, bulges, cracks or de-laminations, applying the criteria for acceptance/rejection in Annex D;
- g) other defects e.g. depressed bung or fire damage applying to the criteria for acceptance/rejection in Annex D;
- h) integrity of all permanent attachments;
- i) integrity of the mandatory permanent marking.

5.2.3 Rejection criteria

Defects and rejection limits are described in:

- Annex A for specific requirements for welded and brazed steel LPG cylinders;

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- Annex B for specific requirements for welded steel LPG cylinders in accordance with EN 14140:2003+A1 or equivalent standard;
- Annex C for specific requirements for welded aluminium LPG cylinder;
- Annex D for specific requirements for composite LPG cylinders.

5.3 Additional inspection / test procedures**5.3.1 Preparation of cylinders**

For all tests:

- a) Inspection, maintenance and scrapping of valves shall be in accordance with EN 14912.
- b) Cylinders with inoperative or blocked valves shall be brought to a place for safe valve removal.

5.3.2 Hydraulic proof pressure test**5.3.2.1 General**

A liquid shall be used as the test medium, e.g. water or kerosene.

5.3.2.2 Preparation of cylinders

In addition to requirements in 5.3.1, the external surface of the cylinder shall be in such condition that any leak can be detected. If the cleaning method involves the wetting of the outside surface, the outside surface shall be completely dried before commencing the test procedure.

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5.3.2.3 Test equipment

Pressure gauges that are used to read the cylinder test pressure shall be in accordance with EN 837-1 and EN 837-3 accuracy class 1,6 or better. They shall be calibrated or checked for accuracy against a master gauge at regular intervals and in any case not less frequently than once a month. The master gauge shall be re-calibrated in accordance with national requirements.

The design and installation of the equipment and the cylinders connected to it shall ensure that no air is trapped in the system.

All joints within the system shall be leak tight.

A device shall be fitted to the test equipment to ensure that no cylinder is subjected to pressure in excess of its test pressure by more than the tolerance given in 5.3.2.4.

The test equipment shall not restrict the expansion of the cylinder.

5.3.2.4 Procedure

- a) Cylinder shall be positioned so that the welds are visible during the test.
- b) Pressure of the test shall be at least the test pressure marked on the cylinder.
- c) Pressure shall be increased gradually in the cylinder until the test pressure is reached. Then the cylinder shall be isolated from the pumping system.
- d) Test pressure shall not be exceeded by more than 20 % or 6 bar, whichever is the least. More than one cylinder may be tested at a time provided they all have a test pressure within the tolerance specified. If

the cylinder is tested to a higher pressure than that marked, a competent person shall check that the actual pressure applied does not result in a general membrane stress in the cylinder wall exceeding 95 % of the guaranteed minimum yield strength of the material used in the finished cylinder.

- e) Test pressure shall be held for the time necessary to inspect the cylinder and check it out for any leak and/or other defects, but not less than 15 s.
- f) If there is leakage in the pressure system, it shall be corrected and the cylinders re-tested.
- g) Cylinders, that do not leak or show any visible permanent distortion after the pressure has been released, shall be deemed to have passed this test. Cylinders, showing visible defects, shall be examined by a competent person.
- h) Cylinders that fail shall be rejected.

NOTE If a cylinder leaks through a pinhole at the weld, it should be examined by a competent person to determine whether it can be repaired by welding or rendered unserviceable. Welding or repairing should be carried out in accordance with the manufacturer's requirements. These types of repairs are not permitted by the ADR.

5.3.3 Internal visual inspection

5.3.3.1 Internal visual inspection for welded and brazed steel LPG cylinders and LPG cylinders of alternative design and construction

5.3.3.1.1 General

Internal visual inspection is applicable to cylinders where the wall thickness is equal to or greater than the minimum calculated wall thickness and the design burst pressure is known, or can be shown to be at least:

- 35 bar for commercial butane cylinders, and
- 70 bar for commercial propane cylinders.

5.3.3.1.2 Preparation of cylinders

- a) Cylinders shall be depressurised in a safe and controlled manner before proceeding.
- b) Cylinders with inoperative or blocked valves shall be brought to a place for safe valve removal.
- c) Valves shall be removed from cylinders. For inspection, maintenance and scrapping of cylinder valves see EN 14912.

5.3.3.1.3 Procedure

- a) After removing the residual liquid, where necessary, and any other foreign matter from the interior, cylinders shall be inspected internally for any sign of corrosion or other defects that may affect their integrity, using a safe inspection lighting system with appropriate internal illumination (e.g. an endoscope).
- b) Cylinders showing signs of internal corrosion, except those having only a film layer of surface rust, shall be removed for further detailed evaluation in accordance with Table A.2 and Table B.2 as appropriate.
- c) If cleaning is required, care shall be taken to avoid damaging the cylinder walls. Cylinders shall be re-inspected after cleaning.