SLOVENSKI STANDARD
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Oprema in pribor za utekočinjeni naftni plin (UNP) - Premične, ponovno polnljive jeklenke za UNP iz jekla, ki niso varjene in trdo spajkane - Periodična kontrola

LPG equipment and accessories - Transportable refillable LPG cylinders other than traditional welded and brazed steel cylinders - Periodic inspection

Flüssiggas-Geräte und Ausrüstungsteile - Ortsbewegliche, wiederbefüllbare Flaschen für Flüssiggas (LPG), ausgenommen geschweißte und hartgelötete Stahlflaschen - Wiederkehrende Inspektion

Équipements pour GPL et leurs accessoires - Bouteilles transportables et rechargeables pour GPL autres que celles en acier soudé et brasé - Contrôle périodique

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23.020.35	Plinske jeklenke	Gas cylinders

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EUROPEAN STANDARD

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English Version

LPG equipment and accessories - Transportable refillable LPG cylinders other than traditional welded and brazed steel cylinders - Periodic inspection

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

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Contents

Page

European foreword

This document (EN 16728:2026) 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of an identical text or by endorsement, at the latest by October 2026, and conflicting national standards shall be withdrawn at the latest by October 2026.

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

This document supersedes EN 16728:2016+A2:2020.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document deals with the periodic inspection requirements for transportable refillable LPG cylinders that are not covered by EN 1440.

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

The new designs of LPG cylinders have led to the development of alternative methods of inspection.

This document has been prepared to reflect the current methodology for periodic inspection of LPG cylinders, and is based on extensive operating experience.

This document 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.

Protection of the environment is a key political issue in Europe and elsewhere, for CEN/TC 286 this is covered in CEN/TS 16765 [6], and this document should be read in conjunction with that.

It has been assumed in the drafting of this document 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 specifically trained for the tasks.

This European Standard has been submitted for reference into the RID [1] and the technical annexes of the ADR [2].

NOTE These regulations take precedence over any clause of this standard. It is emphasized that the RID [1] and ADR [2] are being revised regularly at intervals of two years which can lead to temporary non- compliances with the clauses of this standard.

1 Scope

This document 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 document is applicable to the following:

— welded steel LPG cylinders manufactured to an alternative design and construction, according to EN 14140 or equivalent standard;

— welded aluminium LPG cylinders, according to EN 13110 or equivalent standard;

— composite LPG cylinders, according to EN 14427 or equivalent standard;

— over-moulded LPG cylinders designed and manufactured according to EN 1442 or EN 14140 (see Annexes E and F).

This document can also be applied to stainless steel LPG cylinders designed according to national codes, see Clause A.3. This document can also be applied to composite LPG cylinders designed according to EN 12245, ISO 11119-3 and ISO 11119-4.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 837-1:1996,[1] *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 837-3:1996, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimensions, metrology, requirements and testing*

EN 1442:2017, *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, *LPG equipment and accessories — Transportable refillable LPG cylinders — Disposal*

EN 14140:2014,[2] *LPG equipment and accessories — Transportable refillable welded steel cylinders for LPG — Alternative design and construction*

EN 14427:2022, *LPG equipment and accessories — Transportable refillable composite cylinders for 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*

[1] As impacted by EN 837-1:1996/AC:1998
[2] As impacted by EN 14140:2014/AC:2015

EN ISO 4628-3:2024, *Paints and varnishes — Evaluation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting (ISO 4628-3:2024)*

EN ISO 14245, *Gas cylinders — Specifications and testing of LPG cylinder valves — Self-closing (ISO 14245)*

EN ISO 15995, *Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated (ISO 15995)*

ISO 2859-1:1999,[3] *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
competent authority
authority or authorities or any other body or bodies designated as such in each State and in each specific case in accordance with domestic law

3.2
competent person
person who by combination of appropriate qualification, training, experience, and resources, is able to make objective judgements on the subject

3.3
inspection body
independent inspection and testing body approved by the competent authority

3.4
liquefied petroleum gas
LPG
low-pressure liquefied gas composed of one or more light hydrocarbons, which are assigned to UN Nos. 1011, 1075, 1965, 1969 or 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases

3.5
minor repair
operations that include cleaning and replacement of components accessible without any dismantling of the valve (e.g. outlet seal, excess flow device) and that do not affect the integrity of the pressure receptacle

EXAMPLE outlet seal, excess flow device.

[3] As impacted by ISO 2859-1:1999/Cor 1:2001 and ISO 2859-1:1999/Amd 1:2011

3.6
over-moulded cylinder
OMC
pressure receptacle, intended for the carriage of LPG of a water capacity not exceeding 13 l, made of a coated steel inner cylinder with an over-moulded protective case made from cellular plastic, which is non-removable and bonded to the outer surface of the steel cylinder wall

3.7
periodic inspection
activity carried out at defined intervals, including but not limited to examining, measuring, testing, gauging the characteristics of a pressure vessel and comparing these with specified requirements

3.8
protective casing
layer of protective material which gives mechanical protection which, either cannot be removed without destroying it or is only removable with special tools or is bonded to the cylinder wall

Note 1 to entry: This definition can be applied to cylinders with over-moulded layers or with separate casings.

3.9
reconditioning
major repairs to cylinders, which can include hot work, welding or de-denting carried out by specialists away from potential sources of flammable air/gas mixture

3.10
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

EXAMPLE Fixed valve guard.

3.11
sub-group of OMC
part of a basic population, owned by one single owner

Note 1 to entry: A basic population corresponds to a production of cylinders from only one over-moulding manufacturer using new inner cylinders manufactured by only one manufacturer within one calendar year, based on the same design type, the same materials and production processes

Note 2 to entry: A basic population is split into sub-groups, one per owner. If the whole basic population is owned by one owner, the sub-group equals the basic population.

4 Requirements for periodic inspection

4.1 General

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

Periodic inspections/tests shall be carried out by a competent person under the control of an inspection body based on a written scheme and in accordance with the procedures specified in Table 1.

NOTE 1 A written scheme describes work procedures, criteria, responsibilities and other minimum requirements.

NOTE 2 With the agreement of the competent authority an alternative to the proof pressure test of cylinders is acoustic emission testing, ultrasonic examination or a combination of both.

NOTE 3 Tests can be performed in any order as determined by the written scheme.

4.2 Over-moulded cylinders

Table 1 and Annex E provide specific additional inspection requirements for over-moulded cylinders.

4.3 Composite cylinders

Annex D provides guidance for the determination of periodic inspection interval for composite cylinders.

4.4 Rejected cylinders

Rejected cylinders 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 such that it cannot be re-issued into service as a pressure vessel.

NOTE In some countries, rendered unserviceable means scrapping.

Table 1 — Requirements for periodic inspection

Cylinders types	Procedures
Welded steel cylinders in conformance with EN 14140, or equivalent standard.	— External visual inspection as described in 5.2 and Annex A; — Proof pressure test (hydraulic proof pressure test or, with the agreement of the competent authority, a pneumatic proof test and leak test) as described in 5.3; — Internal condition checks as described in 5.4.1 and Annex A; — Inspection of threads as described in 5.5; — Inspection of valves as described in 5.6.
Welded steel cylinders in conformance with EN 14140, or equivalent standard	
Welded aluminium cylinders	— External visual inspection as described in 5.2 and Annex B; — Proof pressure tests (hydraulic proof pressure test or, with the agreement of the competent authority, a pneumatic proof test and leak test) as described in 5.3; — Internal condition checks as described in 5.4.1; — Inspection of threads as described in 5.5; — Inspection of valves as described in 5.6.
Composite cylinders	— External visual inspection as described in 5.2 and Annex C; — Proof pressure test (hydraulic proof pressure test or, with the agreement of the competent authority, a pneumatic proof test and leak test) as described in 5.3; — Internal condition checks as described in 5.4.2; — Inspection of threads as described in 5.5; — Inspection of valves as described in 5.6.
Over-moulded cylinders	— External visual inspection as described in E.2.2; — Burst Tests as described in E.2.3; — Internal condition checks as described in 5.4; — Inspection of threads as described in 5.5; — Inspection of valves as described in 5.6.

5 Inspection and tests

5.1 General

Relevant cylinder data shall be identified before any inspections or tests are carried out. Cylinders which cannot be safely emptied of gas shall be set aside for special handling. Cylinders with inoperative or blocked valves shall be set aside for safe valve removal.

Before preparing for inspection, manufacturer's guidelines shall be taken into account to avoid any damage to the cylinders.

Any chemical solutions and/or cleaning methods used shall be selected to ensure that they do not adversely affect the cylinder material.

5.2 External visual inspection

5.2.1 Preparation for external visual inspection

a) If necessary, the cylinder shall be cleaned and have all loose coatings or labels, corrosive 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 inspection body shall decide whether a thickness test is required, e.g. ultrasonic thickness check.

NOTE Cleaning methods include wire brushing, shot blasting (in accordance with EN ISO 8501-1 [7] and the EN ISO 8504 series [8]), water jet cleaning, chemical cleaning or other suitable methods, that do not adversely affect any part of the cylinders.

5.2.2 Inspection procedure

5.2.2.1 Welded steel and welded aluminium LPG cylinders

Cylinders shall be inspected for

a) dents, cuts, gouges, bulges, cracks, laminations or punctures, while applying the criteria for rejection in Annex A and Annex B, as appropriate;

b) corrosion while applying the criteria for rejection in A.2 and Table B.2 as appropriate, giving special attention to areas where water can be trapped;

EXAMPLE At the base of the cylinders;

— the junction between the cylindrical shell and the foot-ring;

— the junction between the cylindrical shell and the valve guard or shroud;

— the cylindrical shell and the valve guard or shroud; and

— hidden corrosion, e.g. under handles, applying the criteria for rejection given in Annex A and Annex B as appropriate.

c) other defects (e.g. depressed bung or fire damage), while applying the criteria for rejection given in Annex A and Annex B as appropriate;

d) integrity of all permanent attachments including protective casing where relevant; and

e) integrity of all mandatory permanent markings.

5.2.2.2 Composite cylinders

Cylinders shall be inspected for:

a) cuts, gouges, bulges, cracks or de-laminations, while applying the criteria for acceptance/rejection in Annex C;

b) other defects, e.g. depressed bung or fire damage, while applying the criteria for acceptance/rejection in Annex C;

c) integrity of all permanent attachments including protective casing; and

d) integrity of the mandatory permanent marking.

5.2.3 Rejection criteria

Details of defects and rejection limits are described in:

— Annex A for specific requirements for welded steel LPG cylinders manufactured in accordance with EN 14140 or equivalent standard;

— Annex B for specific requirements for welded aluminium LPG cylinders; and

— Annex C for specific requirements for composite LPG cylinders.

5.3 Proof pressure test

5.3.1 General

The test shall consist of one of the proof pressure tests, as described in 5.3.2 and 5.3.3. The pneumatic proof test shall only be implemented where such an operation does not entail any danger.

NOTE See also the ADR [2], chapter 6.2.1.6.1.

Pressure gauges that are used to read the cylinder test pressure shall be in accordance with EN 837-1:1996 and EN 837-3:1996, accuracy class 1,6 or better. They shall be calibrated or checked for accuracy against a master gauge, at regular intervals and not less frequently than once every six months. The master gauge shall be calibrated in accordance with national requirements. All joints within the system shall be leak tight. The test equipment shall not restrict the expansion of the cylinder.

Alternative methods of pressure measurement (e.g. by transducer) may be used if they achieve equivalent accuracy.

5.3.2 Hydraulic proof pressure test

5.3.2.1 General

A liquid, compatible with the material of construction of the cylinder, shall be used as the test medium.

5.3.2.2 Preparation of cylinders

a) Cylinders shall be depressurized in a safe and controlled manner before proceeding.

b) 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 or if the outside surface is wet due to

outdoor storage conditions, the outside surface shall be completely dried before commencing the test procedure.

5.3.2.3 Test equipment

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

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.

5.3.2.4 Procedure

a) Where appropriate, cylinders shall be positioned so that the welds are visible during the test.

b) The test pressure shall be at least the test pressure marked on the cylinder.

c) The pressure shall be gradually increased in the cylinder until the test pressure is reached.

d) The test pressure shall not be exceeded by more than 20 % or 6 bar, whichever is the least. More than one cylinder can be tested at a time provided they all have a test pressure within the tolerance specified. If the cylinder is tested at a higher pressure than that marked, the owner of the cylinder shall calculate the maximum pressure not to be exceeded to ensure that the general membrane stress in the cylinder wall does not exceed 95 % of the guaranteed minimum yield strength of the material used in the finished cylinder.

e) The test pressure shall be held for the time necessary to inspect the cylinder and examine it for any leak and/or other defects, but no 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 permanent visible 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 this test shall be rejected.

i) The inside of each cylinder shall be thoroughly dried by a suitable method immediately after the pressure test, such that there is no trace of residual water.

j) Records of both passed and failed cylinders shall be in accordance with Clause 8.

5.3.3 Pneumatic proof test

5.3.3.1 Preparation of cylinders

a) Where it is necessary to depressurize a cylinder, this shall be carried out in a safe and controlled manner before proceeding.

b) Repainting before the pneumatic test shall be limited to a primer coat. The finishing coat shall be applied after the test in order not to mask potential leaks.

5.3.3.2 Procedure

a) Cylinders shall be tested in a safe enclosure to protect against rupture under pneumatic pressure. Adequate safety procedures and measures, e.g. hearing protection, shall be adopted to protect personnel in charge of the test.

b) The pressure of the test for a RID [1]/ADR [2] cylinder shall be at least the test pressure marked on the cylinder.

c) Where a separate pressure relief valve is fitted, an adequate margin of safety shall be maintained between the pneumatic proof test pressure and the pressure setting of the pressure relief valve. Where necessary, the pressure relief valve shall be removed and the port plugged for testing.

d) After the cylinder has been placed in a safe enclosure, it shall be charged with the pneumatic test medium (e.g. air, nitrogen) to the test pressure and held at that pressure for at least 5 s. The gas to be used for testing shall be non-flammable to avoid any internal explosion risk. The cylinder shall then be isolated from the pressure source.

e) The test pressure shall be held for the time necessary to inspect the cylinder and examine it for any leak and/or other defects, but not less than 5 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 permanent visible distortion after the pressure has been released shall be deemed to have passed this test. All other cylinders shall be set aside and examined by a competent person.

NOTE It is important to take care to avoid corrosion if full water immersion is used.

h) Cylinders that fail this test shall be rejected.

i) Records of both passed and failed cylinders shall be in accordance with Clause 8.

5.4 Check of the internal condition of the cylinder

5.4.1 Welded aluminium and steel cylinders of alternative design and construction

5.4.1.1 General

The check shall consist of one of the following tests, see 5.4.1.2 and 5.4.1.3.

5.4.1.2 Internal visual inspection

5.4.1.2.1 Preparation of cylinders

a) Cylinders shall be depressurized in a safe and controlled manner before proceeding.

b) Valves shall be removed from cylinders.

c) Where necessary, residual liquid and possible foreign matter shall be removed from the inside of the cylinder.