



SLOVENSKI STANDARD

SIST EN 12807:2010

01-december-2010

Nadomešča:
SIST EN 12807:2002

Oprema in pribor za utekočinjeni naftni plin (UNP) - Premične, ponovno polnljive, trdo spajkane jeklenke iz jekla za utekočinjeni naftni plin (UNP) - Konstruiranje in izdelava

LPG equipment and accessories - Transportable refillable brazed steel cylinders for liquefied petroleum gas (LPG) - Design and construction

Flüssiggas-Geräte und Ausrüstungsteile - Ortsbewegliche, wiederbefüllbare, hartgelötete Flaschen aus Stahl für Flüssiggas (LPG) - Konstruktion und Herstellung

Bouteilles transportables et rechargeables en acier brasé pour gaz de pétrole liquéfiés (GPL) - Conception et fabrication

Ta slovenski standard je istoveten z: EN 12807:2009

ICS:

23.020.30	Tlačne posode, plinske jeklenke	Pressure vessels, gas cylinders
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SIST EN 12807:2010 en,fr,de

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EUROPEAN STANDARD

EN 12807

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2009

ICS 23.020.30

Supersedes EN 12807:2001

English Version

LPG equipment and accessories - Transportable refillable brazed steel cylinders for liquefied petroleum gas (LPG) - Design and construction

Équipement et accessoires pour GPL - Bouteilles
transportables et rechargeables en acier brasé pour gaz de
pétrole liquéfié (GPL) - Conception et fabrication

Flüssiggas-Geräte und Ausrüstungsteile - Ortsbewegliche,
wiederbefüllbare, hartgelötete Flaschen aus Stahl für
Flüssiggas (LPG) - Konstruktion und Herstellung

This European Standard was approved by CEN on 14 May 2009.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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EN 12807:2009 (E)**Foreword**

This document (EN 12807:2009) 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of an identical text or by endorsement, at the latest by December 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document supersedes EN 12807:2001.

The main technical changes are a widening of the range of materials permitted, reference to the latest EN brazing standards, a reduction in the minimum required burst pressure from 50 bar to 35 bar and simplification of the marking requirements by reference to EN 14894.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

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.

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

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.

All pressures are gauge unless otherwise stated.

NOTE This standard requires measurement of material properties, dimensions and pressures. All such measurements are subject to a degree of uncertainty due to tolerances in measuring equipment, etc. It may be beneficial to refer to the leaflet "measurement uncertainty leaflet (SP INFO 2000 27 uncertainty pdf)".

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EN 12807:2009 (E)**1 Scope**

This European Standard specifies the minimum requirements for the design, construction and testing during manufacture of transportable refillable brazed steel Liquefied Petroleum Gas (LPG) cylinders, of water capacity from 0,5 l up to and including 15 l, exposed to ambient temperatures.

This European Standard applies only to cylinders having a circular cross-section without any longitudinal joint.

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.

EN 1044, *Brazing – Filler metals*

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

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

EN 10204:2004, *Metallic products - Types of inspection documents*

EN 12797, *Brazing – Destructive tests of brazed joints*

EN 12799:2000, *Brazing – Non-destructive examination of brazed joints*

EN 13134, *Brazing – Procedure approval*

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

EN ISO 11117:2008, *Gas cylinders – Valve protection caps and valve guards – Design, construction and tests (ISO 11117:2008)*

3 Terms, definitions and symbols**3.1 Terms and definitions**

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

3.1.1**yield strength**

upper yield strength R_{eH} or 0,2 % proof strength (non-proportional elongation), $R_{p0,2}$, for steels that do not exhibit a defined yield

3.1.2**normalised**

heated to a uniform temperature above the upper critical point (A_{c3}) of the steel and then cooled under controlled conditions in still air

3.2 Symbols

- a* Calculated thickness of the cylindrical shell, in millimetres
- A* Percentage elongation after fracture
- b* Calculated thickness of the end of the cylinder, in millimetres
- C* Shape factor for ends (see Table 2, Figure 2 and Figure 3)
- D* Outside diameter of the cylinder as given in the design drawing (see Figure 1), in millimetres
- D_p* Width of the bend test mandrel (see Figure 7), in millimetres
- e* Actual thickness of the material in the finished cylinder (at the point under consideration), in millimetres
- h* Height of the cylindrical part of the end (see Figure 1), in millimetres
- H* Outside height of the domed part of the end (see Figure 1), in millimetres
- L₀* Original gauge length of the test piece, in accordance with EN 10002-1, in millimetres
- n* Ratio of width of bend test mandrel to the thickness of the test piece at the joint (see Table 5)
- P_c* Calculation pressure (1 bar = 10⁵ Pa = 10⁵ N/m²), used to calculate the minimum required thickness of the cylindrical shell and ends, in bar
- P_b* Maximum pressure attained during the burst test, in bar
- P_h* Actual test pressure applied to the cylinder by the manufacturer, in bar
- r* Inside knuckle radius of the torispherical end, in millimetres
- R* Inside spherical radius of the torispherical end, in millimetres
- R_g* Minimum value of tensile strength guaranteed by the cylinder manufacturer for the finished cylinder, in newtons per square millimetre
- R₀* Minimum value of yield strength guaranteed by the cylinder manufacturer for the finished cylinder, in newtons per square millimetre
- R_m* Actual value of tensile strength determined by the tensile test specified in 7.4, in newtons per square millimetre
- R_{eH}* Upper yield strength, in newtons per square millimetre, as defined in EN 10002-1
- R_{p0,2}* Proof strength, non proportional extension in newtons per square millimetre, as defined in EN 10002-1
- t* Thickness of the bend test specimen at the joint

4 Materials

4.1 Materials for shells and end pressings shall be in accordance with EN 10120 or other equivalent material specification or standard meeting the requirements of Table 1. Alternative material specifications shall, as a minimum, specify chemical composition, mechanical properties, heat treatment and delivery conditions.

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The materials shall be suitable for a brazing temperature of 1 100 °C for the duration of the brazing operation, without significant grain growth.

NOTE "Materials" refer to materials in the state before any specific transformation occurring during the manufacturing process.

4.2 All parts brazed to the cylinder shall be brazable and made of material compatible with the cylinder material.

4.3 The brazing consumables (see EN 1044) in the form of wire or paste shall be such that they are capable of giving consistent joints with minimum tensile strength at least equal to that specified for the parent materials in the finished cylinder.

4.4 The cylinder manufacturer shall obtain certificates showing the chemical analysis and details of the mechanical properties of the steel supplied for the construction of the pressure retaining parts. The certificates/reports shall be in accordance with EN 10204:2004, Type 3.1 or higher for shells and ends and Type 2.2 or higher for the valve boss.

4.5 The manufacturer shall maintain a system of identification for the materials used in the construction in order that all materials for pressure parts in the completed cylinder can be traced to their origin.

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Table 1 — Material requirements

Element	Limits %
Materials, other than EN 10120, used for the fabrication of cylinders shall be of brazable quality and the following limits shall not be exceeded in the cast analysis:	
Carbon	0,22 max.
Silicon	0,50 max.
Manganese	0,30 min. to 1,60 max.
Phosphorus	0,025 max.
Sulphur	0,020 max.
Phosphorus plus sulphur	0,040 max.
Use of micro-alloying elements such as niobium, titanium and vanadium shall be limited to the following contents:	
Niobium	0,05 max.
Titanium	0,05 max.
Vanadium	0,05 max.
Niobium plus vanadium	0,08 max.
Where other micro-alloying elements are used, their presence and amounts shall be reported, together with the above, in the steel manufacturer's certificate.	
Should check analyses be required, they shall be carried out either on specimens taken during manufacture from material in the form as supplied by the steel maker to the cylinder manufacturer or from finished cylinders.	

5 Design

5.1 General requirements

5.1.1 The calculation of the wall thickness of the pressure parts shall be based on the yield strength of the material.

5.1.2 For calculation purposes, the value of the yield strength R_o is limited to a maximum of $0,85 R_g$.

5.1.3 The calculation pressure (P_c) shall be not less than the higher of:

- absolute developed pressure at 65 °C of the highest pressure LPG mixture to be filled minus 1 bar, or
- 10 bar.

NOTE ADR [5] and RID [6], P200 specifies test pressures for tabulated mixtures of LPG (UN 1965 HYDROCARBON GAS MIXTURE LIQUEFIED, N.O.S) irrespective of the absolute pressure at 65 °C.

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5.1.4 A drawing, which includes full dimensions that define the cylinder type (see 8.2) and the specification of the material, shall be produced.

5.2 Calculation of cylindrical shell thickness

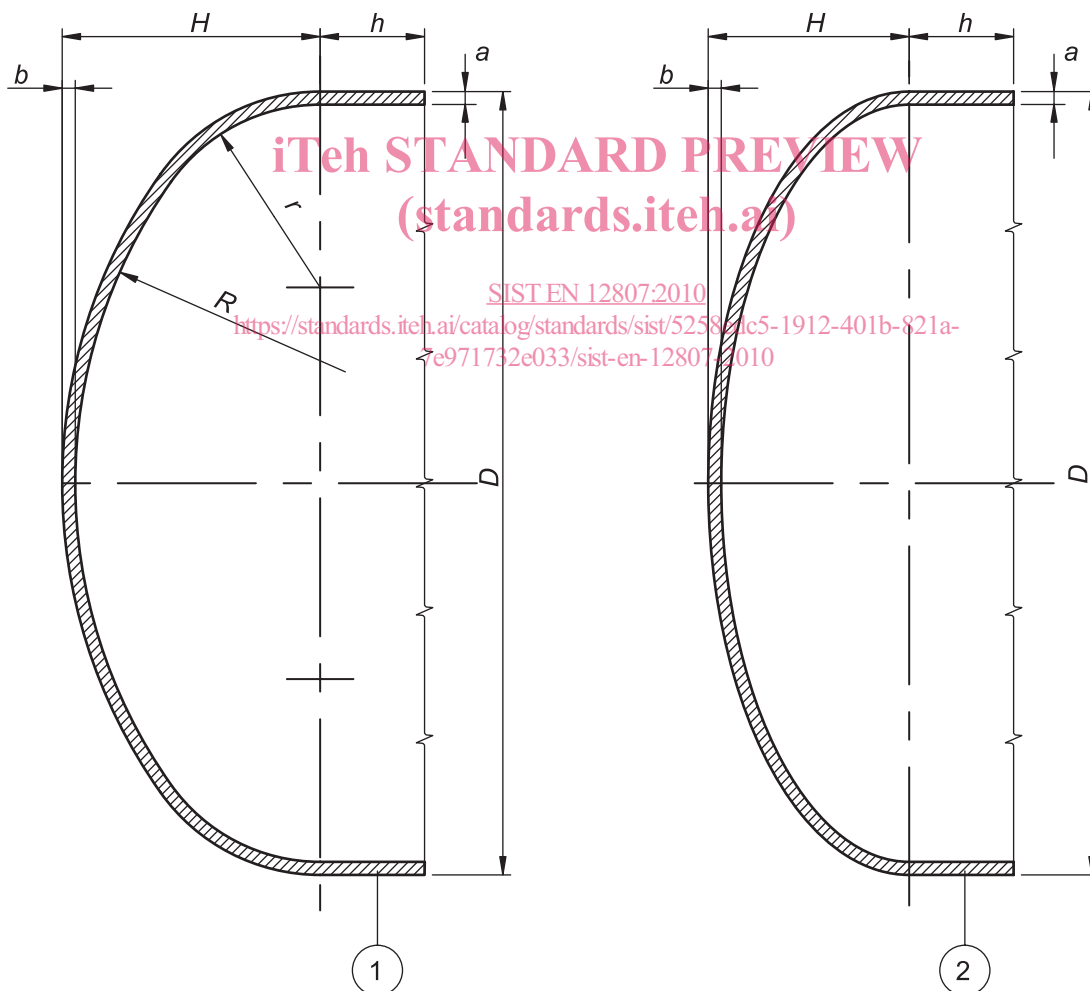
The wall thickness, a , of the cylindrical shell shall be not less than:

$$a = \frac{P_c \times D}{(15 \times R_o) + P_c}$$

5.3 Design of torispherical and semi-ellipsoidal ends concave to pressure

5.3.1 The shape of ends shall be such that the following conditions are fulfilled:

- for torispherical ends $R \leq D$; $r \geq 0,1 D$; $h \geq 4 b$ (see Figure 1),
- for semi-ellipsoidal ends $H \geq 0,2 D$; $h \geq 4 b$ (see Figure 1).



Key

- 1 Torispherical end
- 2 Semi-ellipsoidal end

Figure 1 — Illustration of cylinder ends concave to pressure