

**Komponenter till gasolrivna (LPG) fordon –
Bränsletankar**

Automotive LPG components – Containers

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Foreword

This document EN 12805:2002 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of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

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).

Annexes A, B, K and L are informative, annexes C to J are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard defines requirements for the design, manufacturing and testing of welded steel automotive Liquefied Petroleum Gas (LPG) containers.

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 execution of its provisions is entrusted to appropriately qualified and experienced people.

1 Scope

This European Standard specifies the requirements for design, manufacturing and testing of welded steel automotive Liquefied Petroleum Gas (LPG) containers, to be permanently attached to a motor vehicle, where the automotive LPG is to be used as a fuel in the vehicle.

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).

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

EN 288-3, *Specification and approval of welding procedures for metallic materials - Part 3: Welding procedure tests for the arc welding of steels.*

EN 589, *Automotive fuels - LPG - Requirements and test methods.*

EN 876, *Destructive test on welds in metallic materials - Longitudinal tensile test on weld metal in fusion welded joints.*

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

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

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

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 22768-1, *General tolerances - Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1:1989).*

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1:1997).*

EN ISO 7438, *Metallic materials - Bend test (ISO 7438:1985).*

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EN ISO 7799, *Metallic materials - Sheet and strip 3 mm thick or less - Reverse bend test (ISO 7799:1985)*.

ISO 1106-1, *Recommended practice for radiographic examination of fusion welded joints - Part 1: Fusion welded butt joints in steel plates up to 50 mm thick*.

ISO 2504, *Radiography of welds and viewing conditions for films - Utilization of recommended patterns of image quality indicators (I.Q.I.)*.

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

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

3.1.1

test pressure

pressure to which the container is subjected during the test procedure

3.1.2

design pressure

pressure on which the calculations are based

3.1.3

working pressure

pressure under normal operating conditions

3.1.4

container

vessel used for the storage of automotive LPG

3.1.5

cylindrical container

container with a cylindrical shell and two dished ends, either torispherical or elliptical

3.1.6

special container

container other than the cylindrical container

3.1.7

type of containers

container or a group of containers where the individual container does not differ significantly with respect to the following conditions:

- the manufacturer (different trade names or marks possible);
- the shape;
- the openings;
- the material;
- the welding process;
- the heat treatment;
- the production line;
- the diameter;

- height (in case of a special container);
- the nominal wall thickness

3.1.8

stress relieving

heat treatment given to objects to reduce the residual stresses without altering the metallurgical structure of steel, by heating to a uniform temperature, A_{C_1} , and cooling in a controlled atmosphere

3.1.9

normalising

heating to a uniform temperature, A_{C_3} , of the steel and then cooling in a controlled atmosphere

3.1.10

hot-rolled

deformation of the material at the critical temperature A_{C_3}

NOTE A_{C_1} and A_{C_3} will be obtained from the material data sheet.

3.1.11

longitudinal weld

weld over the full length of the shell or cylindrical part of the shell, excluding welds for fittings

3.1.12

batch

number of containers made under the same process, that belong to the same family

3.1.13

parent material

material in the state before any specific transformation with regards to the container manufacturing process

3.1.14

Liquefied Petroleum Gas (LPG)

mixture of light hydrocarbons, gaseous under normal atmospheric conditions which can be liquefied by increased pressure or decreased temperature. The main components are propane, propene, butane and butene isomers

3.1.15

automotive LPG

motor fuel complying with EN 589

3.2 Symbols and abbreviations

- a* is the minimum calculated wall thickness of the cylindrical shell in mm,
- b* is the minimum calculated wall thickness of the dished ends in mm,
- e* is the actual wall thickness,
- C* is the shape factor,
- D* is the nominal outside diameter of the container in mm,
- F* is the force in N,
- g* is the gravity in m/s^2 ,
- h* is the height of cylindrical part of dished end in mm,
- H* is the outside height of dished part of container end in mm,

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- P_b is the maximum pressure measured in the burst test in kPa,
 P_h is the hydraulic test pressure /design pressure in kPa,
 r is the inside knuckle radius of the dished end of the standard cylindrical container in mm,
 R is the inside dish radius of the dished end of a standard cylindrical container in mm,
 R_e is the minimum yield stress in N/mm^2 guaranteed by the material standard,
 R_m is the minimum tensile strength in N/mm^2 guaranteed by the material standard,
 z is the welding factor,
HV is the Vickers hardness,
PRV is the pressure relief valve,
PRD is the pressure relief device or fuse.

4 Technical requirements

4.1 General provisions

The container for vehicles using automotive LPG in their propulsion system shall function in a correct and safe way.

The materials of the container shall be compatible with LPG.

All necessary corrosion prevention measures shall be taken to protect the finished container including any permanently fixed parts.

4.2 Dimensions

For all dimensions without indication of tolerances, general tolerances of EN 22768-1 shall apply.

4.3 Steel

Steel for shells, dished ends, welded plates and rings (see annex D) shall be in accordance with EN 10120. Steels other than those in EN 10120 may be used, provided that the container complies with the requirements of this standard.

The container manufacturer shall ensure that all parent materials are free from defects.

Container parts shall be made of materials that are compatible when welded.

The filler materials shall be compatible with the material to form welds with properties equivalent to those specified for the parent material (see EN 288-3).

The container manufacturer shall obtain and provide chemical cast analysis certificates and mechanical properties of the steel used for the construction of the parts subject to pressure.

The container manufacturer shall maintain a system for identification in the fabrication so that all parent materials for parts subject to pressure can be traced.

The container manufacturer shall maintain records of the results of metallurgical and mechanical tests and analyses of parent and filler materials.

4.4 Design temperature

The minimum design temperature shall be – 20 °C.

The maximum design temperature shall be + 65 °C.

For extreme operating temperatures, exceeding the above, a minimum design temperature of – 40 °C shall be applied.

4.5 Design pressure

The design pressure of the container shall be 3 000 kPa.

4.6 Heat treatment

The container manufacturer shall maintain records to demonstrate that the containers have been adequately heat treated.

Localised heat treatment of a completed container shall not be permitted.

The heat-treatment shall be according to the following:

a) containers with a wall thickness greater than or equal to 5 mm:

- for hot-rolled and normalized material: stress relieving or normalizing;
- for material of a different kind: normalizing;

b) containers with a wall thickness less than 5 mm:

- normalizing the whole container, or
- normalizing the parts having been deformed by more than 5 %.

Heat treatment shall not be required if, in a tensile test carried out after forming by a standard procedure in accordance with EN 10002-1, the elongation after rupture is 14 % or more.

4.7 Calculation of the parts under pressure

4.7.1 Wall thickness of the cylindrical shell

The minimum wall thickness a of the cylindrical shell shall be calculated according to the following calculation:

– containers without a longitudinal weld:

$$a = \frac{P_h D}{1500R_e + P_h}$$

– containers with a longitudinal weld:

$$a = \frac{P_h D}{1500R_e z + P_h}$$

For the value z see 5.2.4.2.