



SLOVENSKI STANDARD

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Varnostni ventili za ponovno polnjive jeklenke za utekočinjeni naftni plin (UNP)

Pressure relief valves for transportable refillable cylinders for Liquefied Petroleum Gas (LPG)

Sicherheitsventile für ortsbewegliche, wiederbefüllbare Flaschen für Flüssiggas (LPG)

Soupapes de sûreté des bouteilles transportables et rechargeables pour gaz de pétrole liquéfiés (GPL)

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EUROPEAN STANDARD

EN 13953

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May 2003

ICS 23.060.40

English version

Pressure relief valves for transportable refillable cylinders for Liquefied Petroleum Gas (LPG)

Soupapes de sûreté des bouteilles transportables et
rechargeables pour gaz de pétrole liquéfiés (GPL)

Sicherheitsventile für ortsbewegliche, wiederbefüllbare
Flaschen für Flüssiggas (LPG)

This European Standard was approved by CEN on 21 April 2003.

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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 Management Centre has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 13953:2003) 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of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

Annexes A, C and D are informative, Annex B is 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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EN 13953:2003 (E)**1 Scope**

This European Standard specifies the design, testing and marking requirements for spring loaded pressure relief valves, for use in liquefied petroleum gas (LPG) cylinders.

These valves can be either an integral part of a cylinder valve (see EN 13152 and EN 13153) or a separate device.

This European Standard does not exclude the use of other designs of pressure relief devices that provide a similar level of safety.

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 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment.*

EN 751 (all parts), *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water.*

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

EN 1563, *Founding – Spheroidal graphite cast irons.*

EN 10270-3, *Steel wire for mechanical springs - Part 3: Stainless spring steel wire.*

EN 12164, *Copper and copper alloys – Rod for free machining purposes.*

EN 12420, *Copper and copper alloys – Forgings.*

EN 13906-1, *Cylindrical helical springs made from round wire and bar – Calculation and design - Part 1: Compression springs.*

3 Terms, definitions and abbreviations**3.1 Terms and definitions**

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

3.1.1**LPG**

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

3.1.2**pressure relief valve**

valve which automatically, without the assistance of any energy other than that of the fluid concerned, discharges a quantity of fluid so as to prevent a predetermined safe pressure being exceeded, and which is designed to re-close and prevent the further flow of fluid after normal pressure conditions of service have been restored. The loading due to the fluid pressure underneath the valve-sealing element is opposed by a spring

3.1.3

pressure/flow terms

NOTE 1 Terms used with LPG pressure relief valves are described graphically in annex A.

NOTE 2 All pressures are gauge pressures unless otherwise specified.

3.1.3.1

nominal set pressure

predetermined pressure of the pressure relief valve at which the valve is set to start to discharge

3.1.3.2

start to discharge pressure

inlet pressure at which the first of a stream of bubbles appears at the outlet of a pressure relief valve through a water seal of not more than 50 mm water column, or other equivalent method

3.1.3.3

pop action

rapid opening of the valve sealing element to achieve full lift, resulting from an increase of inlet pressure creating a sudden increase in force and compression of the spring

3.1.3.4

overpressure

pressure range between the nominal set pressure and the flow rating pressure

3.1.3.5

re-seat pressure

inlet pressure at which the sealing element effects a seal with the valve seat after the valve has been subjected to pop action

3.1.3.6

flow rating pressure

inlet pressure at which the discharge capacity is measured

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3.1.4

nominal discharge capacity

minimum discharge capacity at the flow rating pressure expressed in cubic metres per minute of free air at STP rounded down to one decimal place

3.1.5

discharge capacity

capacity at the flow rating pressure of a pressure relief valve expressed in cubic metres per minute of free air at STP

3.1.6

sealing element

non-metallic resilient component which effects the seal by contact with the pressure relief valve seat

3.1.7

valve seat

normally raised area of the pressure relief valve body on to which the sealing element effects a seal

3.1.8

cylinder valve

valve fitted to transportable refillable LPG cylinders from 0,5 l up to 150 l water capacity intended to convey LPG only

3.1.9

leak tightness

resistance to leakage to atmosphere across the valve seat or any other pressure containing component when the valve is closed

EN 13953:2003 (E)**3.2 Abbreviations**

STP Standard Temperature and Pressure [15,6 °C (288,7 K), 1,013 bar absolute (0,1013 MPa absolute)]

4 Operating temperatures

Valves designed in accordance with this European Standard shall be suitable for:

- a minimum operating temperature of - 20 °C in service. Temperatures below this are acceptable for short periods for example, when filling;
- a minimum operating temperature of - 40 °C for those parts of Europe where valves are subject to more severe temperature conditions. The material and design shall be shown to be satisfactory for operations under these conditions and shall meet the requirements of annex B;
- a maximum operating temperature of 60 °C. Temperatures above this are acceptable for short periods.

5 Materials**5.1 General**

5.1.1 Materials in contact with LPG shall be physically and chemically compatible with LPG under all normal operating conditions for which the valve is intended.

5.1.2 Materials for valve components shall be selected to give adequate strength in service. Consideration shall be given to all modes of failure including atmospheric corrosion, brass dezincification, stress corrosion, impact or material failure.

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5.1.3 Alternative materials to those listed in 5.2 are not precluded, providing they can be shown to be equivalent.

5.1.4 Where pressure relief valves are an integral part of a cylinder valve, the material requirement of the cylinder valve standard shall be complied with.

5.2 Metallic materials

5.2.1 Metallic materials for valves shall be stainless steel, copper alloys, aluminium alloys, zinc alloys, or other suitable materials, and shall comply with 5.1.1 and 5.1.2.

5.2.2 Hot stamped brass shall be non-porous and shall be suitable for machining or other processes. Sand-cast brass shall not be used.

Leaded brass shall be CW614N or CW617N in accordance with EN 12420 and EN 12164.

Cold drawn brass rods up to 45 mm wide in cross-section shall only be used after heat treatment and testing for internal cracking. Cold drawn brass rods greater than 45 mm wide in cross-section shall not be used.

Components produced from stamping brass shall not exhibit cold shuts, also known as folds, or surface defects.

5.2.3 Components, when made from stainless steel, shall contain not less than 17 % chromium and not less than 7% nickel.

Springs shall be manufactured from stainless steel in accordance with EN 10270-3 or material with an equivalent resistance to corrosion.

5.2.4 Castings shall be free from inclusions and surface defects, which adversely affect the strength, leak tightness or performance of the valve.

5.2.5 Spheroidal graphite cast iron in accordance with EN 1563, with an elongation at fracture of more than 18 % shall be used. Other ductile irons or cast irons shall not be used.

5.3 Non-metallic components

5.3.1 All non-metallic materials in contact with LPG shall not distort, harden or adhere to the body or seat face to such an extent as to impair the function of the valve.

All rubber materials shall also comply with the requirements of EN 549. The ozone test in EN 549 shall only be carried out where gaskets/seals are exposed to atmosphere.

5.3.2 For guidance on the choice of non-metallic materials, see [3] ISO 11114-2.

5.4 Lubricants, sealants and adhesives

Where used on operating threads and seals, lubricants, sealants and adhesives shall be compatible with LPG and not interfere with the operation of the valve. Sealants shall comply with the requirements of EN 751.

6 Design

6.1 General

6.1.1 Pressure relief valves shall be designed to operate with a pop action within the overpressure of the valve.

The valve components shall be designed with adequate strength and adequate clearances to ensure correct operation in service.

6.1.2 The sealing element carrier shall be manufactured from a metallic material with a minimum melting point of 450 °C. Non metallic materials can be used if they are able to meet the same requirements without deformation or degradation which would impair the operation of the valve.

6.1.3 The design shall incorporate guiding arrangements of the sealing element to ensure reliable operation and leak tightness.

6.1.4 The sealing element shall be secured to prevent it becoming loose in operation.

6.1.5 Means shall be provided to lock and/or to seal the pressure relief valve in order to prevent and/or reveal any tampering with the settings. Adhesive shall not be used.

6.1.6 When pressure relief valves are provided with a means of protection (such as a disc or cap) to prevent the ingress of foreign matter, such protection shall be designed so as not to be easily displaced except by the discharge from the pressure relief valve and shall not interfere with the proper operations of the valve.

6.1.7 The minimum required discharge capacity of the pressure relief valve can be calculated in accordance with annex C.

6.1.8 The nominal set pressure for pressure relief valves shall have a value between 2,4 MPa and 3,5 MPa (24 bar and 35 bar) as specified to the manufacturer.

NOTE The nominal set pressure should be greater than the maximum operating pressure of the LPG and less than the permanent deformation pressure of the cylinder.

6.2 Threads

The end connections for pressure relief valves intended to be directly fitted into the cylinder, shall be either a taper thread or a parallel thread combined with a sealing and securing method.