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Oprema in pribor za utekočinjeni naftni plin (UNP) - Specifikacija in preskušanje ventilov in fitingov za tlačne posode za UNP (vključuje dopolnilo A1)

LPG Equipment and accessories - Specification and testing for Liquefied Petroleum Gas (LPG) pressure vessel valves and fittings

Flüssiggas-Geräte und Ausrüstungsteile - Spezifikation und Prüfung für Ventile und Fittinge an Druckbehältern für Flüssiggas (LPG)

Équipements pour GPL et leurs accessoires - Spécifications et essais des équipements et accessoires des réservoirs pour gaz de pétrole liquéfié (GPL)

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LPG Equipment and accessories - Specification and testing for Liquefied Petroleum Gas (LPG) pressure vessel valves and fittings

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This European Standard was approved by CEN on 11 February 2019 and includes Amendment 1 approved by CEN on 2 June 2020.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 13175:2019+A1:2020) 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of an identical text or by endorsement, at the latest by December 2020, and conflicting national standards shall be withdrawn at the latest by December 2020.

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 includes Amendment 1 approved by CEN on 2020-05-08.

This document supersedes A1 EN 13175:2019 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

A1 *Deleted text* A1

A1 This document has been submitted for reference in

— the RID and

— the technical annexes of the ADR

NOTE These regulations take precedence over any clause of this standard. It is emphasised that RID/ADR are being revised regularly at intervals of two years which may lead to temporary non-compliances with the clauses of this standard. A1

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document calls for the use of substances and procedures that may be injurious to health and/or the environment if adequate precautions are not taken. It refers only to technical suitability; it does not absolve the user from their legal obligations at any stage.

It has been assumed in the drafting of this document that the execution of its provisions is entrusted to appropriately qualified and experienced people.

All pressures are gauge pressures unless otherwise stated.

NOTE This document 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 can be beneficial to refer to the leaflet “measurement uncertainty leaflet” SP INFO 2000 27 [4].

1 Scope

This document specifies minimum requirements for the design, testing and production testing of valves, including appropriate fittings, which are connected to mobile or static LPG pressure vessels above 150 l water capacity. Pressure relief valves and their ancillary equipment, contents gauges and automotive LPG components are outside the scope of this document.

This document does not apply to refineries or other process plants.

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 549:1994, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 751-1:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds*

EN 751-2:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds*

EN 751-3:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes*

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

EN 1092-1:2018, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1267:2012, *Industrial valves — Test of flow resistance using water as test fluid*

EN 1563:2018, *Founding — Spheroidal graphite cast irons*

EN 1759-1:2004, *Flanges and their joint — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 1: Steel flanges, NPS 1/2 to 24*

EN 1774:1997, *Zinc and zinc alloys — Alloys for foundry purposes — Ingot and liquid*

EN 1983:2013, *Industrial valves — Steel ball valves*

EN 10270-3:2011, *Steel wire for mechanical springs — Part 3: Stainless spring steel wire*

EN 12164:2016, *Copper and copper alloys — Rod for free machining purposes*

EN 12165:2016, *Copper and copper alloys — Wrought and unwrought forging stock*

EN 12420:2014, *Copper and copper alloys — Forgings*

EN 12516-1:2014+A1:2018, *Industrial valves — Shell design strength — Part 1: Tabulation method for steel valve shells*

EN 12516-4:2014+A1:2018, *Industrial valves — Shell design strength — Part 4: Calculation method for valve shells manufactured in metallic materials other than steel*

EN 13445-2:2014, *Unfired pressure vessels — Part 2: Materials*

EN 13547:2013, *Industrial valves — Copper alloy ball valves*

EN 13709:2010, *Industrial valves — Steel globe and globe stop and check valves*

EN 13789:2010, *Industrial valves — Cast iron globe valves*

EN 13799:2012, *LPG equipment and accessories — Contents gauges for Liquefied Petroleum Gas (LPG) pressure vessels*

EN 13906-1:2013, *Cylindrical helical springs made from round wire and bar — Calculation and design — Part 1: Compression springs*

EN 15202:2012, *LPG equipment and accessories — Essential operational dimensions for LPG cylinder valve outlet and associated equipment connections*

EN 60079-0:2012, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079 0:2011, modified)*

EN ISO 196:1995, *Wrought copper and copper alloys — Detection of residual stress — Mercury(I) nitrate test (ISO 196:1978)*

EN ISO 11114-1:2012, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials (ISO 11114-1:2012)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 301:2006, *Zinc alloy ingots intended for castings*

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

ISO 6957:1988, *Copper alloys — Ammonia test for stress corrosion resistance*

ANSI/ASME B1.20.1 - 1983, *Pipe threads, general purpose (inch) issued by American National Standards Institute in 1983*

ASME B1.5 - 1990, *ACME Screw Threads issued by American Society of Mechanical Engineers in 1990*

3 Terms and definitions

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

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms

3.1.1
liquefied petroleum gas
LPG
low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN 1011, UN 1075, UN 1965, UN 1969 or UN 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases

3.1.2
pressure vessel
assembly of the pressure envelope (including the openings and their closures) and non-pressure-retaining parts attached directly to it

3.1.3
maximum allowable pressure
maximum pressure for which the equipment is designed

Note 1 to entry: All pressures are gauge pressures unless otherwise stated.

3.1.4
fitting
pressure containing component fitted to an LPG pressure system

3.1.5
internal leak tightness
resistance to leakage across the valve seal or other internal sealing components when the valve is closed

3.1.6
external leak tightness
resistance to leakage through the fitting to or from the atmosphere

3.1.7
residual flow
allowable flow through an excess flow or a non-return valve, when the valve is in the closed position

3.1.8
sealing element
non-metallic resilient component which effects a seal by contact with the valve seat

3.1.9
excess flow valve
valve designed to close automatically, with a small residual flow, when the fluid flow passing through it exceeds a predetermined value, and to re-open when the pressure differential across the valve has been restored below a certain value

3.1.10
non-return valve
valve designed to close automatically to restrict reverse flow

3.1.11
shut-off valve
valve to provide a leak tight seal which is operated either manually, remotely or is self-closing

3.1.12
service valve
valve for fluid off-take which is manually operated to provide a leak tight seal

3.1.13
filler valve
valve system for liquid fill service

3.1.14
plug
component which seals a female connection

3.1.15
cap
component which seals a male connection

3.1.16
overfill protection device
OPD
device designed to automatically reduce the filling rate to a minimal flow when the fill level reaches a predetermined amount

3.1.17
occasional liquid withdrawal valve
OLW valve
normally blanked valve, used for occasional liquid withdrawal which is designed to be opened by the engagement of a special connector valve

3.1.18
internal valve
valve which has its seal within the profile of the pressure vessel

3.1.19
self-closing valve
normally closed valve that provides a leak tight seal, opens by the engagement of a special connector or by fluid passing through it and closes automatically upon removal of the connector or by stopping the fluid flow

3.1.20
vapour equalizing valve
valve which permits vapour to flow in either direction in order to equalize vapour pressure between pressure vessels during liquid transfer, and which incorporates an excess flow valve and a self-closing valve opened by a special connector valve

3.1.21
multipurpose valve
valve which incorporates two or more service functions and which meets the combined requirements of the individual functions

3.1.22
breakaway coupling
coupling which separates at a predetermined section when required and each separated section contains a self-closing shut-off valve, which seals automatically

Note 1 to entry: Also referred to as a safe break.

3.1.23
dry disconnect coupling
quick coupling which connects and disconnects with minimum LPG release and each separated section contains a self-closing shut-off valve, which seals automatically

3.1.24
Standard Temperature and Pressure
STP
15,6 °C (288,7 K), 1,013 bar absolute (0,101 3 MPa absolute)

3.2 ACME couplings terms

3.2.1
male coupling
coupling with a male thread

3.2.2
female coupling
coupling which includes a female threaded loose nut on a centre spigot

4 Operating conditions

4.1 Valves and fittings designed in accordance with this document shall be suitable for a minimum operating temperature of −20 °C.

NOTE In service, temperatures below this can be encountered during short periods, for example, during filling.

4.2 For some parts of Europe and certain applications, temperatures lower than −20 °C can be encountered; for these conditions the requirements of Annex B shall be applied.

4.3 Valves and fittings shall be designed for a maximum operating temperature of 65 °C.

4.4 Valves and fittings shall be designed for a maximum allowable pressure of 30 bar.

4.5 Valves and fittings shall be designed for a minimum pressure of 50 mbar absolute.

NOTE Vacuum conditions on the valve or fitting, arising from butane at low temperature or evacuation of the pressure vessel can expose the valve or fitting to a vacuum of 50 mbar absolute.

5 Materials

5.1 General

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

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

5.1.3 Alternative materials to those listed in 5.2 are not precluded, providing they comply with a standard or specification that ensures control of chemical and physical properties, and quality appropriate to the end use.

5.2 Metallic materials

5.2.1 Metallic materials for valves and fittings shall be steel, stainless steel, copper alloys, aluminium alloys, zinc alloys, or other suitable materials.

5.2.2 Shell materials shall be selected in EN 12516-1:2014+A1:2018, EN 12516-4:2014+A1:2018 or EN 13445-2:2014.

5.2.3 Materials for steel flanges shall be in accordance with EN 1092-1:2018.

5.2.4 Stainless steel for components shall contain not less than 16 % chromium and shall contain not less than 7 % nickel.

5.2.5 Springs shall be manufactured from stainless steel in accordance with EN 10270-3:2011.

5.2.6 Hot stamped brass shall be non-porous and suitable for machining or other processing. Leaded brass shall be CW614N or CW617N in accordance with EN 12420:2014, EN 12164:2016 and EN 12165:2016. Sand-cast brass shall not be used. Cold drawn brass rods shall only be used for machining after adequate testing for internal cracking, porosity or other inclusions and shall be heat treated if required. Components produced from stamping brass shall not exhibit cold shuts also known as folds, or surface defects.

5.2.7 Components manufactured from hot stamped brass or bodies made of drawn brass or machined from brass rod shall be capable of withstanding, without cracking, the stress cracking test (see 8.11)

5.2.8 Spheroidal graphite cast iron shall comply with EN 1563:2018, with an elongation at fracture of more than 18 %. Other ductile irons or cast irons shall not be used.

5.2.9 ZnAl4 and ZnAl4Cu1 shall be in accordance with ISO 301:2006 or EN 1774:1997.

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

5.2.11 For guidance on the choice of metallic materials, see EN ISO 11114-1:2012.

5.3 Non-metallic components

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 549:1994. The ozone test in EN 549:1994 shall only be carried out where gaskets/seals are exposed to atmosphere.

NOTE For guidance on the choice of non-metallic materials, see EN ISO 11114-2:2013.

5.4 Lubricants, sealants and adhesives

Where used on threads and seals; lubricants, sealants, and adhesives shall be compatible with LPG and shall not interfere with the operation of the valve or fitting.

Sealants shall comply with EN 751-1:1996, EN 751-2:1996 or EN 751-3:1996.

6 Design – general requirements

6.1 General

6.1.1 Valves and fittings shall be capable of withstanding all service conditions, including fatigue, to which they will be subjected during normal conditions of use (or carriage where appropriate) as detailed in Table 3.

6.1.2 Moving parts shall have sufficient clearance to ensure freedom of movement under all normal conditions of service. Where necessary, means of guidance shall be provided to ensure correct seating or sealing.

6.1.3 All components vital to the function of a valve or fitting shall be secured to prevent disassembly during normal operation. Internal valves shall be either automatically operated or remotely operated to prevent inadvertent operation.

6.1.4 Valves and fittings shall be designed to ensure external leak tightness, internal leak tightness and their function shall not be affected as a result of vibration during transportation.

6.1.5 For mobile applications, the valves and fittings shall be capable of withstanding a deceleration of 100 times gravity, after reaching a minimum velocity of 10m/s, in the X, Y and Z axis and shall remain leak tight.

6.1.6 In transport applications, valves and fittings directly [A1⟩ connected ⟨A1] to the shell (including the internal stop-valve and its seating) shall be protected [A1⟩ against the danger of being wrenched off by external stresses. ⟨A1] This may be achieved by the provision of weak sections or shear grooves in the valve or fitting that allows the sealing mechanism to remain within the shell after failure. These valves and fittings shall fulfil the test requirements of 8.10.

[A1⟩ *deleted NOTE* ⟨A1]

6.1.7 The design shall take account of the use of dissimilar materials.

EXAMPLE Electrochemical corrosion or material expansion.

6.1.8 Electrical equipment, when used with a valve or fitting shall meet the requirements of EN 60079-0:2012 where appropriate.

6.1.9 Valves shall have their flow resistance determined using water as a test fluid.

6.1.10 Possible stress corrosion shall be eliminated by either design or heat treatment.

6.1.11 The design shall take account of the following:

a) minimizing the use of raw materials;

b) minimizing the environmental impact of in-service maintenance and end of life disposal; and

c) efficient packaging of finished product.

6.2 Seats and seals

6.2.1 Valves and fittings shall be designed to allow installation without damaging non-metallic seats or seals.

6.2.2 Sealing may be achieved by either elastomeric or other non-metallic material.

When a metal to metal closure is used, the residual flow test requirements of 8.6 shall be met.

6.2.3 The sealing element ensuring internal leak tightness shall be attached or otherwise assembled such that it will not become dislodged under service conditions. The means to secure the sealing element shall not rely solely on adhesive.

6.3 Springs

Springs shall be designed in accordance with EN 13906-1:2013.

6.4 Threads

6.4.1 Taper threaded pressure vessel connections shall comply with ANSI/ASME B1.20.1 - 1983. Thread sizes shall not exceed DN 80.

6.4.2 Where taper threads are used, the design shall ensure that over-torquing shall not impede the correct operation of the valve or fitting, see 8.3.

6.4.3 Taper threaded sections of a body designed for a pressure vessel connection shall be constructed with wrenching flats.

6.4.4 All threads other than taper threaded pressure vessel connections shall be in accordance with a European Standard or an International Standard or shall be ACME threads in accordance with Annex A or ANSI/ASME B1.20.1 - 1983. Where the design includes 3 1/4 inch x 6 ACME threads, periodic inspections of the couplings are required. Annex C provides recommendations for these periodic inspections.

6.4.5 To avoid mismatching with ANSI/ASME B1.20.1 – 1983 threads, ISO 7-1:1994 threads shall not be used.

6.5 Flanges

Flanges shall comply with EN 1092-1:2018 or EN 1759-1:2004.

7 Design - specific requirements

7.1 Excess flow valve

7.1.1 Excess flow valves shall be designed so that when closed the flow past the seat to allow for reduction of differential pressure across the valve, shall not exceed that of an opening of 1,8 mm^2 cross sectional area.